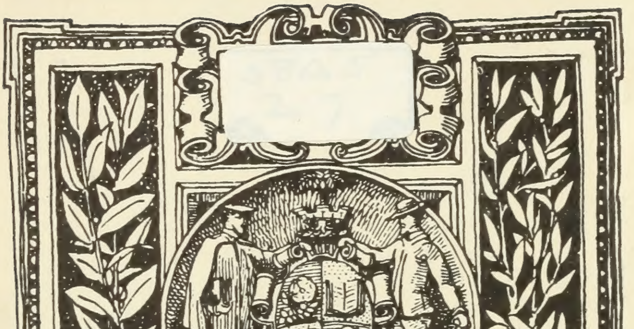
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ALICE EASTWOOD,

EDITOR.

VOLUME III.

1892

SAN FRANCISCO, CALIFORNIA.

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Errata Vol. III.

Page 52, for "Ammostrephes" read "Ommastrephes."
" 203, first genus, place second bracket after Richardson.
" 204, No. 11, for "Dona Ana County, New Mexico," substitute "Texas"
" 206, third line, for "James's Bay, Hudson's Bay," read "James Bay, Hudson Bay."
" 206, No. 12, for "macrohabdotes," read "macrorhabdotes."
" 206, No. 15, for "Valley of the Sacramento River," read "Foothills of the Sierra Nevada."
" 208, No. 28, omit "Northwestern New Mexico."
" 213, No. 82, for "nebracensis," read "nebrascensis."
" 220, No. 165, for "Sorrex," read "Sorex."
" 223, eighteenth line, for "Dobson, Mon. Insectivora," etc., read "Dobson, Ann. & Mag. Nat. Hist., 5th ser., xviii, 1886, 124-125."
" 261, seventh line from bottom, for "Am. Rept." read "Ann. Rept."
" 261, second line from bottom, for "Forsteri," read "fosteri."
" 279, fifth line, for "Berkeley," read "Los Angeles."
" 279, twenty-fifth line, for "William M. Price," read "William W. Price."
" 117, in title, for "albicolis," read "albicollis."

ZOE

A BIOLOGICAL JOURNAL.

VOL. III. APRIL, 1892. No. 1.

FORMS OF TREES AS DETERMINED BY CLIMATIC INFLUENCES.

BY GUSTAV EISEN.

A traveler from the Arctics or from the high wooded mountains, in any district of the world, cannot but be impressed by the different forms which trees and shrubs assume in the respective regions. Nowhere is this difference in form more striking than between the trees inhabiting the pine region of Sierra Nevada and those which grow on the lower plains in the interior valleys.

We have so constantly been accustomed to take things as they are, without inquiring into the causes why they are so, that it seems to us quite natural that the forms of trees of the high mountains should be different from those of the lowlands and valleys. Still this difference is so great and so very apparent that the causes which operate in making up these different forms must be very great and very important ones.

In the high Sierras, for instance, in that region below the snow line, where the pines and spruces dominate, we find that almost every shrub and every tree resembles the other in a general way. The trees are tall and erect, with a central undivided trunk from which the branches slope down towards the ground. The shrubs, again, are low and depressed, spreading out horizontally, forming dishlike masses, hugging the ground instead of seeking the sky. A few thousand feet further down in the region where the evergreen pines and spruces have ceased, the trees as well as the shrubs begin to assume a different aspect. The trees in this region are not so erect, their branches are less sloping, their crowns extend further, the trunks are often branching; there is, in fact, a decided difference in their general form. The shrubs, again, are more erect and bushy, forming often dense masses, which show little or no tendency to flatten out.

If we again follow the vegetation further down to the plains, the change in form is yet more pronounced. The trees are here as a rule branched close to the ground, their crowns are wider and spreading, the branches drooping and often sweeping the ground. The general form, which in the higher Sierras was that of an elongated pyramid, has here changed and become globular. We may call these respectively, the spruce form, and the oak form. In the higher mountains we rarely meet with the oak form, at least not in evergreen trees, and on the plains the spruce form is equally rare. There are some exceptions to this rule, but they are few and in no way interfere with the theory which I will here set forth and endeavor to prove. Before we dwell upon the causes which have been and yet are operating in creating and maintaining these characteristic forms of trees, it is necessary to first consider those causes which combine in affecting a change in the form of trees generally.

Nearly every visitor to the wind-beaten and open seashore has noticed the characteristic forms of trees and shrubs growing there. The shrubs spread close to the ground, the trees lean towards the interior, their crowns spread out horizontally and their branches are thorny and knotty and continually bent. Such a sight is common everywhere in exposed places. In sheltered localities inland these same varieties grow upright, their crowns become less horizontal, the branches less twisted, and the same shrubs, which on the sea shore hug the soil, grow here straight and send out slender branches. Even to the least observant the force that operates here and causes the trees and shrubs to so change their shapes is the wind. When we see such trees and shrubs painted on a canvas, we know at once that the landscape is a wind-beaten one, and that the vegetation is struggling against a force which is trying to destroy its foothold.

But while the wind is especially active on the seashore in changing the natural or perhaps the original form of the trees and shrubs, it is similarly effective to a lesser degree in any locality at all exposed to winds. The interior plains, the cliffs on the sides of the desert, the high mountain peaks, the elevated plateaus, the table mountains, the slopes of the more sheltered sides of islands, in fact everywhere may the power of the wind be perceived.

The effects of the wind may be temporary or permanent; temporary, if the plant regains its original form and outward appearance when removed from the windy region to a sheltered one. This is by

far the most common effect and especially refers to shrubs. Many instances may be cited, but I will only mention one. *Baccharis pilularis*, which grows everywhere on the coast around San Francisco, clings typically to the soil and sandhills where exposed to the wind, while on the north side of Tamalpais, where the shelter is perfect and even in the oak scrub of Golden Gate Park, it assumes an erect form. So different is the outward appearance between these two forms, that the former has been described as a distinct species, *B. consanguinea.*

Similarly on nearly all our high mountain tops we meet with scrub-pines growing in the crevices and clinging to the rocks like real coverlets of verdure. But the same species may be found further down in the elevated valleys growing erect with sloping branches and undivided trunks. Such instances are common. I may, however, here especially recall the dwarf and scrubby *Pinus monticola* growing in the cañons on the slope of Mount Dana, while further down splendid specimens are crowding the sheltered meadows.

As an instance, again, where the effects of the wind have been partly permanent we may point to the Monterey pine *(Pinus insignis)* and to the Monterey cypress *(Cupressus macrocarpa)*. Mature specimens of these varieties assume always horizontal crowns, even when growing inland, and only during their earlier growth do they show a tendency to grow erect like most species of pines or coniferous trees generally. We may presume that if the evolution of a species is accompanied by this continued wind force, the latter will to a great degree mould the outward form of the species. If again the evolution of a species takes place under various conditions of wind and calm, the form of the species will be variable according to exposure.

The effect of the wind while apparent everywhere and while found in every climate and in every country is, however, not the most powerful agent in shaping the forms of trees and shrubs. The snow which part of the year covers vast territories, often to a depth of thirty or more feet, has a great influence upon the forms of all plants which are exposed to it for a longer or shorter time.

As the effects of the snow depend chiefly upon the resistance to pressure, it will be seen that evergreen and deciduous trees must be unequally affected. The foliage of the evergreens offers much more resistance to the snow than do the bare limbs of trees and shrubs

which during the winter season are void of leaves. In some horticultural districts, where snow but seldom falls, and where accordingly such trees as olives, oranges and lemons are cultivated successfully, an occasional fall of snow may do and has in many instances done considerable harm. We know that when the snow lodges on the evergreen and upright limbs of orange trees, these limbs become so heavy that they break down, more or less ruining the trees. On such occasions the growers hurry through their orchards shaking off the snow before it begins to melt and become heavy, thus freeing the limbs of the trees from the burden that would injure them. The cause of the mischief is thus not alone to be found in the snow, but also in the upright shape of the limbs and trunks of the trees. Those limbs which point upwards do not yield readily under the pressure of the snow, and trunks which are repeatedly forked, will, if the pressure is heavy enough, split lengthwise. In case the trees in question had possessed downward sloping limbs and an upright, undivided or standard trunk, the effect of the snow pressure would have been less dangerous; the limbs would have yielded to their snow burden, which, when melting, would have slipped off, leaving the limbs free, and the undivided trunks would not have split, and the trees would have escaped without injury. If such snowfalls were frequent and regular, only such varieties could be cultivated as were possessed of downward sloping limbs and upright trunks. All trees shaped otherwise would gradually be ruined and their cultivation become impossible. These last remarks refer only, or at least principally, to evergreen trees. If the orange trees, which we gave as an example, instead of being evergreens were deciduous, that is, presenting only bare limbs in the winter, like peaches, apricots and pears, the pressure of the snow would not have injured them, at least not by breaking their limbs and splitting their trunks, and their cultivation would not necessarily have been abandoned. If we consider a forest, instead of a horticultural district, we will find that the conditions are there very much the same. The yearly snowfall, if only heavy enough, tends to break down and destroy all wild evergreen trees, which do not possess a form suitable to resist the heavy snow mantle. Trees which would thus suffer would be all evergreen trees with spreading crowns, such as live oaks, laurels, madroña, certain pines, such as Monterey pine, digger pine *(Pinus Sabiniana)*, Italian pine *(Pinus*

Pinaster), Lebanon cedar, and the hundreds, if not thousands, of other evergreen trees which inhabit regions below the regular snow line.

Nature thus eliminates from snow-visited forests all evergreen trees which are not suited to resist the pressure of the snow. On the contrary, the snowfall makes it possible for all those trees to live and survive which, through their outward form, are able to easily shed the accumulated snow. As regards deciduous trees, no such upright trunks and sloping branches are necessary, as the bare limbs do not accumulate the snow, nor suffer under pressure. If the above is true, the forests of snow-visited districts will be found to consist of only such varieties of trees as possess the requisite form, that is, evergreen trees with upright, undivided trunks and downward sloping branches, as well as of deciduous trees of various not especially characteristic forms. Upon examination this will also be found to be the case.

A visit to the high pine forests of Sierra Nevada shows us just such forests. Nowhere is the snowfall heavier and nowhere is the characteristic form of the evergreen trees more pronounced. This is also the case in all other show-visited regions where forests are at all able to exist. Where the snowfall is the heaviest and lasts the longest, all evergreen trees, at least during a certain period of their life, possess the required pyramidal form. Evergreen trees of any other form would in their struggle for existence have little or no chance to compete with better equipped neighbors. It follows, also, that the less the snowfall the less characteristic will prove the pyramidal form in all evergreen species, while lower down the mountains on the warmer slopes the pyramidal form may be expected to be entirely absent.

To refer to our nearest high mountains, the Sierra Nevada, we find thus on the snow-belt such trees as *Abies Douglasii*, *Picea amabilis*, *Pinus Lambertiana*, *Libocedrus decurrens*, *Sequoia gigantea*, etc. All these show in a characteristic way the pyramidal form, the snow-shedding branches and the undivided trunk. We find in this region no large live oaks, nor any large evergreen trees of globular or goblet shape. But in the region immediately below the heavy snow belt, the characteristic pyramidal shape is entirely absent. The forms of the evergreen trees are here evidently regulated by other agencies. In this region we meet with several evergreen

oaks with large crowns, spreading branches and repeatedly divided trunks. The pines also, like *P. Sabiniana*, are characterised by their forked trunks, their upright limbs, and by their general resemblance to deciduous trees. As regards shrubs of all kinds, they are hardly less influenced by snowfall. In the snow-visited forests at least, the evergreen shrubs show a low depressed form, sometimes spreading out like dishes on the ground. Other species, again, like the manzanitas, possess repeatedly zig-zag bent limbs especially adapted to resist the pressure of snow and wind. Such zig-zag form is also possessed by the branches of trees, greatly assisting them to resist outside pressure of any kind. Thus while the lower or central branches of most of the pines in the snow region slope downwards, the upper limbs, which are naturally less exposed to snow pressure, assume a horizontal position, but are compensated by being repeatedly bent and furnished with heavy knees. Such limbs are generally seen in the various species of pines, such as *Lambertiana*, *contorta*, *Jeffreyi*, also in *Sequoia gigantea*, etc., while they are almost absent in the spruces and firs, the sloping elastic limbs of which continue to the tops.

SUNLIGHT AND HEAT.

Another important agency in shaping the forms of trees is the direct sunlight and heat. As the force of the direct rays of the sun is different in different places, it follows that their effect upon trees and shrubs must vary with the locality, as well as with the physiological structure and nature of the plants. Various other agencies, such as the moisture in the air, the force of the wind, the rainfall, dews and fogs, combine with the sunlight and heat, either in decreasing or increasing the effects. It is especially in warm and dry regions where the heat and light are all powerful in modifying and directing the development of the form of a tree or shrub. An excess of heat and light is nearly always hurtful and may even be so injurious as to kill the trees, or make them unfit for the region. It is especially the horticulturist that notes these effects of heat and light. In tender plants the effects are more pronounced and principally of two kinds. The direct rays of the sun injure the stem or trunk on the southwest side, or on the side on which the greatest force of the sun rays are concentrated during or shortly after midday. The tender bark and cambium are scorched, dry up and pre-

vent the sap from circulating. In course of time injurious insects, such as borers of various kinds, find their way through crevices, and parasites gradually destroy the trees. Trees which are thus especially tender are, among cultivated trees, apples and pears, and among wild trees, weeping willows, poplars, young oaks, maples, etc. A tree when once injured seldom recovers if left to itself, but dies or at least becomes sickly. In order to counteract this fatal force of excessive light and heat combined, the horticulturist encourages lower limbs and foliage, prunes his trees low, or otherwise shades the exposed parts. Nature works very much in the same way. Young trees growing in heated regions are covered with lower limbs thickly set with foliage, or develop large weeping tops or crowns with drooping branches, which shelter the tender stems as effectually as if they were covered with an umbrella. That such a shade is absolutely necessary can be clearly demonstrated. There is, for instance, no more tender tree than our common weeping willow, a native of the hot region of Asia Minor. This tree flourishes even in our warmest regions under proper conditions of moisture, as long as its natural form is not interfered with. But let anyone prune back its limbs and cause the direct rays of the hot sun to strike its trunk, and the tree will soon become diseased and die. The dying of weeping willows is common all over the warmer parts of this state, and is everywhere to be principally ascribed to the cutting away of limbs and to the entrance of heat and direct light.

The excessive heat and light has also a bad effect upon the ground in places where rain or other moisture is scarce. The sun dries out the soil and makes it too dry for the trees and plants. To counteract this heat, nature causes lower limbs to spread out as close to the ground as possible, or furnishes the tree with large dense and rounded crowns which cover the soil with shade and prevent the moisture in the immediate vicinity of the trunk and roots from drying out.

Nature furnishes also other remedies, such as peculiar position of the leaves, tough and hardy bark, gray and light colors of leaves and stems, hairs or cells especially constructed to withstand evaporation or heat.

While the snow especially affects evergreens, the heat and light affect evergreens and deciduous trees almost alike.

In the tropics the intense heat develops another tree form, the umbrella form. In this region the heat is always accompanied by moisture, and is thus never excessive or dangerous for trees which naturally seek the light. The moisture and heat combined produce a most vigorous and dense vegetation, the very opposite to what is found in the arid zones. The effort of the tree is therefore concentrated in its endeavor to reach the light and to push out from the dense shade nearer the ground. The most vigorous growing trees in this region send up straight and undivided trunks to a level with the top of the dense undergrowth, branch at this level and form immense umbrella-like crowns above less vigorous trees. This umbrella-form gives to the tropical landscape a distinct and characteristic appearance. A tendency to assume such an umbrella-form can also be recognized among those trees of the temperate zone, which grow in moist places, such as river bottoms, cañons and other sheltered localities—trees in fact, which delight in moisture. But nowhere is the form so pronounced as in the tropics, where it is common with all large species of the denser forests. The uplands of the tropics, where the rainfall is less and where heat and drying winds are more powerful, and where accordingly the vegetation is less dense, the umbrella form is rare, or where it exists is caused by other agencies.

The origin of the tropical umbrella form is therefore not exactly identical with that of the umbrella form assumed by most pines in such districts as the Mediterranean or the gulf region of the United States, and to a certain extent also by a few more northern pines. This umbrella form is caused by the falling off of the lower branches, which never possess the strength of the upper limbs. The umbrella form, however, greatly favors their struggle against wind and heat.

In these drier places in the tropical districts the umbrella form gives place to the globular form, the conditions there being quite similar to what they are in the drier regions further north. Observe, for instance, the form of the ceiba *(Bombax Ceiba)*, which inhabits dryer localities in the Central American tropics. This tree is almost globular in shape, in order that its branches may give necessary shelter to the trunk and to keep away the reflected heat. An effort to change the form of this tree by pruning results fatally, as the branches become sun scalded and a prey to borers which

eventually destroy the tree. In crossing Central America I was especially impressed by these different tree forms, characteristic of different regions. Along the lowlands of the Pacific Coast up to 2,000 to 3,000 feet, the characteristic form of the various strong growing trees was the umbrella form. Above 3,000, and from that altitude towards the interior in the dry and warm district the globular form predominates. As we ascend the interior highlands in the vicinity of Coban the climate suddenly changes and becomes very moist. With this change comes also a change in the form of the trees which here assume the regular umbrella form. The same climate continues uninterrupted to the Atlantic Coast, and the district is characterized throughout by the predominating umbrella form.

All trees require more protection when young, and this explains why young trees are shaped differently from older trees. Thus the form of a young specimen of the common blue gum *(Eucalyptus)* is well known. While young the tree is pyramidal and the sloping branches are covered by horizontally extended leaves. No form can be more adapted to withstand heavy winds. As the tree grows older, the stem stronger, and the roots penetrate deeper, this original form is not required any more, and the tree assumes a semi umbrella-like crown.

If we consider the principal forms of trees in their connection with influences of wind, snow, rain, sunshine and heat, we find that the various forms may be grouped principally under the following heads:

A. The upright form, with a central undivided trunk and with downward sloping branches. This form is possessed by most conifers inhabiting snow-visited regions. The downward slope of the branches facilitates the shedding of the snow, while the undivided trunk offers less resistance to heavy loads of snow. Forked or branched trunks would split or break.

This form may be either necessary to the species, as when the latter is confined to snow-visited districts (example *Picea amabilis)*, or it may be inherited and continue as a characteristic of the species which grows in a warmer climate, but which evidently had been evolved from a species which once inhabited colder regions. Example: the redwood *(Sequoia sempervirens)*, Lawson cypress *(Cupressus Lawsoniana)*, and many other evergreen trees inhabiting

the moist, snowless climate of the Pacific Coast north of San Francisco.

B. The upright form with erect or horizontal branches. The upright trunk in this form must be considered as inherited from ancestors where it was a necessity. Later on the sloping branches gradually assumed a horizontal position. Example: most species of cypress, yew, juniper, etc., of a more southern origin. It is interesting to note the form of *Cedrus Deodara* or Himalaya cedar. This tree, growing in regions of Himalaya where heavy snowfalls are not unfrequent, possesses while young characteristically downward sloping branches. *Cedrus Libani*, Lebanon cedar, which is only a form of *C. Deodara*, possesses no such sloping branches, but horizontal branches, evidently developed in a climate where the absence of heavy snow has made the downward slope of the branches unnecessary. Most species of juniper possess erect branches, as would be expected in a genus which finds its most congenial home and greatest development in the warmer regions of the Mediterranean where snow is almost unknown.

One species (*Juniperus communis*), however, which is common in Northern Europe, is distinguished by a very different form from the southern species, being dwarfed, prostrate, and repeatedly branched. But that this form of the European juniper is not the natural one, can be seen by the fact that whenever this species is transferred to snowless localities it at once assumes the upright form, growing as straight and slender as a southern cypress. Similarly we find this upright form possessed by all specimens of this juniper which grow in close proximity to smelting works, where the heat is strong enough to melt the snow. The different appearance of this juniper in such localities is really most startling.

Pines which inhabit snow-visited regions are as a rule very upright, with downward sloping branches, while the southern pines, both in Europe and North America, as well as in Central America and Mexico, have branches which either spread horizontally or which stand erect. Compare, for instance, *P. Lambertiana* and *P. Cembra*, which inhabit snow-visited regions, with such species as Aleppo pine (*P. Halapensis*), *P. maritima*, *P. insignis*, and *P. Sabiniana*. Judging by the forms of most species of pines it would seem as if this genus is more of a southern origin, than for instance the various genera of firs and spruces, which through their very characteristic

undivided stems and sloping branches indicate their origin in the snowy regions in the north.

C. The globular form. This form is possessed by trees in warm and dry regions or localities. The object of the form is to protect the tree from sun and heat, and to preserve the moisture in the soil around the root. Example: the live-oak, the wild California walnut, the Texas umbrella, and the tropical ceiba, or Bombax tree. The mesquite of the Mojave desert belongs to this form.

D. The umbrella form. This form is principally found in moist tropical climates. The object of the form is to give to the tree as much sun and heat as possible, which can again only be had at a certain altitude above the tops of the dwarfer vegetation. Example: various papilionaceous trees, as well as most varieties of trees in the tropical lowlands of both continents.

In connection with this, I will call attention to the form of the bases of the trunks and of the surface roots in trees growing in moist places, especially in the tropics. The trunks branch out above the soil and form peculiar horizontally compressed roots, sometimes five to six feet high, but only a few inches thick. Such surface roots are found in most tropical trees, as well as in many swamp trees; for instance, the swamp cedar of the Mississippi delta. The object is to steady the tree when floods or excessive rains soften the ground; round roots would then offer much less resistance.

I have here merely tried to outline the principal forms of trees and their trunks and branches, and have endeavored to state the causes which have been at work in moulding them.

There are, however, many other agencies which assist in forming the shape of trees. Such are the elasticity of the wood, which would make the pyramidal shape of the tree less necessary; hairiness of the leaves, which tends to counteract sun and dryness; a tough and thick bark, which would also render sun and heat less injurious—all these must be taken in consideration when we study the forms of trees.

CATALOGUE OF THE LAND AND FRESH-WATER MOLLUSCA OF LOWER CALIFORNIA.

BY J. G. COOPER.

In an article published in the Proceedings of the California Academy of Sciences, second series, vol. iii, April, 1891, I stated that only three species of land shells had yet been found to inhabit the region on both sides of the boundary-line near lat. 32° 30′, while twenty-one were peculiar to the southern half of the peninsula. I overlooked an incomplete list by Mr. C. R. Orcutt in the "West American Scientist," ii, 61, July, 1886, adding five northern species, which he had traced southward to (or near) lat. 31°. They were identified by Mr. Binney. He and Mr. H. Hemphill, also found three new species on both sides of the line, and added much to the known distribution of others. (See Binney's 3d Supplement to Terr. Mollusks, 1890, pp. 205, 219, 221; also the 4th Suppl., 1892, and the "Nautilus" for 1890–91.)

To furnish a basis for future reference, and to point out some facts needing investigation, I have compiled this catalogue of all the species known from the peninsula and adjacent islands. To simplify the list I omit the sub-generic names, many of which are badly founded, thus using the nomenclature nearly as given by Binney in the "Land and Fresh Water Shells of North America," (Washington, 1869).

That is the latest work giving a full account of the shells of the peninsula, and in the twenty-one years since its issue nineteen land species have been added, eleven or twelve fresh-water, and one marine pulmonate species, doubling the number then known.

Probably no other country has had so many errors made in the localities given for its land-shells, and I therefore give every reference accessible, chiefly from Carpenter's "Mollusca of Western North America," 1856 and 1864, explaining the causes of errors as far as possible.

The geographical range of each species, as far as known, is given in the proper places.

The great variability in external characters observed in all west-coast land and fresh-water mollusca is strongly marked in those of the peninsula, and will doubtless lead to reduction in number of species. I have indicated some of these where most striking, but

at the same time I am in favor of retaining many others as subspecies or varieties. Those who have seen Mr. Hemphill's recent Catalogue of N. Amer. Shells, etc., will understand how the multiplication of names may be carried to excess, and I therefore mention only those that are best defined. Many more local forms must be collected before they can be properly defined.

It will be observed on measuring the peninsula as mapped by the U. S. Coast Survey, that on account of its position, oblique to the meridians, it is much longer than would appear by a calculation from latitudes, the difference being 120 statute miles, and total length 820 miles. The distances apart will thus be greater than the degrees of latitude indicate, by nearly fifteen miles in every hundred, in the long axis of the peninsula.

I refer to this because I have found it necessary to give the latitudes of localities on account of the frequent repetition of names, in places at various distances apart. By referring to Mr. Brandegee's map, we find that towns, old missions, ranches and waterholes (camping places), may each have the same name though far apart, and that bays, points and islands add to the confusion. Thus they can only be distinguished by giving the latitude as near as possible, those on the coast only being exact. Such errors of localities are mentioned as to fourteen out of forty-eight species mentioned in this article.

There are several explanations of the confusion of localities on the peninsula, and most of it comes from the too frequent use of the names of the saints. This would not be so bad, if the surnames distinguishing them had been retained, as first given by missionaries, but being cumbersome they have been gradually dropped in most cases, though retained where very necessary, as with San José del Cabo. In other cases the same names are repeated in the three separate states of the peninsula, as they are in many of the United States, but sometimes three in one state as with the San Juans. Many Indian and other names are also repeated, probably from the ignorance of those naming them. The name of nearly every saint in the calendar is repeated two or three times in those 820 miles.

Carpenter states that Xantus sent shells to Washington from Socorro Island, and other localities, mixed with those of Cape St. Lucas.

On account of the marked differences in the groups of species

inhabiting the mountains, the salt water, and the desert region near the Colorado River, I have divided the list into three parts. The last has not before been included in lists of species belonging to Lower California. Though the desert species do not extend into the peninsula itself below lat. 31° 30′, they have been known for thirty-six years to be found along the Colorado River and its back-water overflow, called "New River," which discharges fifteen miles south of the boundary. Until recently most of them were supposed to be extinct species.

In this catalogue I have used the alphabetical order for convenience of reference, and quoted authorities chronologically in references to localities, etc. Those given in quotation marks have not been confirmed or corrected. Most authors before 1850 confused Upper with Lower California.

Collectors' names are given in italics to indicate that they were at the places mentioned, while those quoting them are usually marked by names in brackets.

The species thus far collected on the peninsula and islands near by have been all of considerable size, and no attempt seems to have been made to find the very small species, except in the part north of lat. 31°, from whence five are known (Nos. 26, 30, 31, 32, 33). Though the more arid regions may not produce them, the moist seashores, damp cañons, and mountain summits, will no doubt still furnish novelties to a careful searcher, many of good size, as shown by Gabb's success in the mountains near the east coast.

A. Species of the Mountain Regions.

1. Binneya notabilis J. G. Cooper, 1863. Santa Barbara Island, Cal., lat. 33° 30′ (types). West coast of Mexico ("*Xanthonyx*" Crosse & Fischer). Guadalupe Island, over 100 miles southwest of San Quintin Bay, near lat. 29°, *Palmer*, *Bryant*, San Quintin, Lower Cal., lat. 30° 24′, *Orcutt*.

2. Bulimulus artemisia W. G. Binney, 1861. "Promontory of Cape St. Lucas, lat. 22° 52′, one specimen, *Xantus*.

B. californicus Reeve, 1848, is not confirmed as from the peninsula, but is believed by late authors to be from the main land.

3. B. excelsus Gould, 1853. "California," Maj. Rich, La Paz, lat. 24° 10′, later, in Carpenter's work; also found there by *L. Belding*.

4. B. GABBI Crosse & Fischer, 1872. Locality unknown, and only one specimen known, which has characters between those of *B. pallidior* and *B. proteus.* These two allied forms are not reported from any one locality except Cape St. Lucas, therefore a hybrid theory cannot now be proved. It may prove a variety, if *B. vegetus* Gould, which is also intermediate, is not a good species.

5. B. INSCENDENS W. G. B., 1891. "Cape St. Lucas and 450 miles up west coast" (Cedros Is. lat. 28° 02′ not confirmed), Xantus.

Var. BRYANTI J. G. C., 1891. San José del Cabo, lat. 23° 24′, to La Paz, lat. 24° 12′. The east coast form, more developed.

6. B. PALLIDIOR Sowerby, 1833. "Chili," *Cuming* (Pfeiffer). "West coast of peninsula for 350 miles north (to Ballenas Bay, lat. 26° 45′, not confirmed), *Xantus.* La Paz, Maj. Rich. San Juan, east coast, lat. 26° 20′, Lt. Greene, type of *B. vegetus* Gould, 1853. Near San José del Cabo to La Paz, *Bryant.* "San Diego" (Carpenter), not confirmed. Perhaps imported from Chili into gardens with roots, and has since died out northward. No other collectors seem to have found any *Bulimuli* on west coast north of lat. 25°. Mr. Binney mentions several species carried about with roots of banana, etc., from one country to another, and this may account for the introduction of this and *B. proteus* on to the peninsula.

7. B. PILULA W. G. B., 1861. Todos Santos, lat. 23° 25′, to Margarita Island, lat. 24° 20′, *Xantus.* San José del Cabo, *Bryant.*

8. B. PROTEUS Broderip, 1832. "Peru and Chili," *Cuming ?*, (Pfeiffer). "Cape St. Lucas," *Xantus.* Northern Peru, *Orton*, (Binney). Perhaps another importation as with *B. pallidior.* The question of their importation as food is yet undecided.

9. B. SPIRIFER Gabb., 1867. Near La Paz, lat. 24° 10′, to San Borgia near lat. 28° 40′, among rocks, in the mountains near east coast. *Gabb.* San Borgia is a little west of the middle line in crossing the peninsula, and thus the most northern and western locality for *Bulimuli* as yet well authenticated. It is about 450 miles from the cape, and may possibly have furnished Xantus with northern specimens, which could be mistaken for *B. pallidior.* With such an extensive range near the east coast it is strange that nobody had found it before. Gabb's figure is more like *B. pallidior* than Binney's.

10. B. SUFFLATUS Gould, 1853. La Paz, lat. 24° 10′, *Maj. Rich*, *Gabb*. San José del Cabo, *Bryant*. The large, east coast form of *B. pilula*.(?) Not found by Xantus, nor on west coast. Bryant also found a few pale brown ones, besides the usual white; both colors in living shells.

11. B. XANTUSI W. G. B., 1861. "Promontory of Cape St. Lucas," four specimens, *Xantus*. The three species reported from the Cape, but not since detected, and two others which Xantus stated to extend so far up the west coast, but not confirmed, were perhaps considered by him as varieties of one or more of the other species. The possibility that he obtained some from Socorro Island, or from the Mexican coast, where he also collected, is to be considered.

12. CYLINDRELLA IRREGULARE Gabb, 1867. Central range of mountains near east coast, around Mulejé, lat. 26° 50′, *Gabb*.

13. C. TAYLORI Pfeiffer, 1861. *(C. newcombiana) Gabb*, 1867. Same locality as the last, *Gabb*. Original locality of Pfeiffer's type unknown.

14. HELIX AREOLATA "Sowerby MS." (Pfeiffer, 1845). California *Hinds*, "near Columbia River" (Pfeiffer). This confusion can only be explained by mixing of labels, as Pfeiffer seems to have received these shells from the British Museum for description, with the MS. names. "Margarita Bay, lat. 24° 20′. The only land shell received from the bay," (Pease). Cedros Island, lat. 24° 02′, *Veatch*, a very large form described as *H. veatchii*, Newcomb. These, with *H. levis* and *pandoræ*, form a closely allied group.

In 1867 Mr. W. M. Gabb made a geological exploration of the peninsula for a land company, under J. Ross Browne, traveling the whole length and crossing it ten times. In his report to Mr. Browne, dated San Francisco, 1869 (published in J. R. Browne's Report on Mining Regions), he mentions finding immense numbers of this species, sometimes whitening the ground with bleached shells, and extending from Salada, lat. 24° 15′, to San Tomas, lat. 31° 35′, on west coast. He mentions none of the allied forms, and thus appears to consider them varieties. (See notes on them). Dr. Veatch in same report states that the var. *veatchii* was the only land shell he found on Cedros Island, and on the peninsula east of it.

Unfortunately Gabb nowhere records any notes on other species, except eight, as quoted in this paper.

15. H. DURANTI Newcomb, 1864 (var. *cælata* Mazyck). Santa Barbara Island, J. G. C. (types). Northern race from Healdsburg, 38° 38′, Calif., to Sta. Barbara, *Hemphill.* The var. thence south to San Tomas, lat. 31° 35′, *Yates*, *Hemphill.*

16. H. KELLETTII, Forbes, 1850. "California," (Santa Barbara),? *Kellett.* "San Juan del Fuaco," (Forbes). This San Juan having been proved to be neither the Straits of De Fuca, nor San Juan Capistrano, southern California, lat. 33° 30′ (northern limit of this shell), is usually considered as the port on the east coast, lat. 26° 20′, visited by Lt. Greene, who did not find this shell there (neither did Gabb). Forbes states that this and *H. pandoræ* were obtained on the *west* coast, probably between "San Diego and Magdalena Bay," lat. 24° 32′. (Carpenter, Rept. on Moll. of West Amer., 1856, p. 239.) Yet it has been generally confounded with the Straits of Juan de Fuca (an explorer, who made no claim to be a saint). Kellett & Wood also surveyed in those straits, and there are both a bay and an island named San Juan there. But none is given on late maps along the west coast of the peninsula, though two "San Juans" are put down as on the gulf shore, one distinguished as a bay, about lat. 26° 20′, the other at a point of land in lat. 28° 25′, and a third one, a camp station, near lat. 28°, twenty miles inland, all visited by W. M. Gabb.

There is also a San Juanico on west coast, lat. 26° 12′, where Gabb collected marine shells (only ?) as given in a catalogue printed in the Proc. Cal. Acad, Sci., series i, vol. v, 1875. Even this was confounded by Stearns with San Juan Bay, and it is left uncertain at which place the marine shells were collected, though Gabb in the report before mentioned. states that he collected some at San Juanico, one of the places at which he crossed the peninsula.

The well-known Spanish custom of distinguishing the patron saint of a locality by a surname taken from some local incident, leads to the inference that the one above named was so entitled from either the word fuco (seaweed) or fuego (fire), in either case mis-spelled by Forbes. Then the fact that the two land shells are only known to exist together between lats. 29° 30′ and 30°, the most arid and rocky region on the west coast, suggests that a landing was made

in that region near some ranch which has since been abandoned (like many others), or was never mapped down. The type figured by Forbes was smaller and higher-colored than any variety of the species now known from its more northern range, of which ten or more have been named by Hemphill and others. Its lost station may be one of the small islands. The blunders of authors that were made before 1873 as to this locality are amusing, and it was not until then that explorations had proved that the two species named must have come from the peninsula, together with the two allied forms, while positive locations are only now ascertained. "Central America" given by Reeve is about as bad an error as Straits of Juan *de* Fuca. (N. B.—J. R. Browne states that this is a real family name, but the *San* Juan has it *del* meaning "*of the.*")

17. H. LEVIS Pfeiffer, 1845. "California," *Hinds*. El Rosario, lat. 29° 50′, *Orcutt*. "Columbia River" is another blunder of Pfeiffer's (see *H. areolata*). Varieties indicate that this form may intergrade with that and *H. pandoræ*. It seems limited in range between the two forms named.

18. H. NEWBERRYANA W. G. B., 1858. San Pedro, Cal., lat. 33° 40′, *Yates* (fossil only?). San Diego, *Newberry*, lat. 32° 40′. South to Ensenada, lat. 31° 51′, *Orcutt*.

19. H. PANDORÆ Forbes, 1850. "Santa Barbara as per box label" (Carpenter). "San Juan del Fuaco, Kellett and Wood" (Forbes). "Margarita Island, lat. 24° 20′" (Newcomb, Binney). San Quintin, lat. 30° 24′, *Orcutt*, the only positive location yet obtained, but is reported from further north. Forbes' locality is explained under *H. Kellettii*, but it is not identified for either species lately. The next is probably correct, but conflicts with Pease's statement about *H. areolata*. It seems probable that he, as well as Gabb, considered this form, like the small form of *areolata*, merely one of the varieties of that species. *H. damascenus* Gould, 1856, from "Desert east of California, *Dr. Frick*" (Newcomb), but not confirmed from north of the boundary, was probably from near San Tomas, and is considered a variety of *pandoræ*. As to variations in this group compare the figures already published. W. G. Binney gives copies of the original types in Terr. Moll. of the U. S., vol. iv; in Land and Fresh Water Shells he figures quite different varieties of all these species, and Tryon in the Monograph,

Amer. Jour. of Conchology, vol. ii, gives two others, all these intergrading.

20. H. ROWELLII Newcomb, 1865. "Arizona" *Dr. Frick.* This has lately been confirmed by specimens obtained near Phœnix (Pilsbry). A variety from near Mulejé, lat. 26° 52′, was described as a new species, "*H. lohrii*" Gabb.

An intermediate locality has been recently discovered by Dr. S. Bowers in San Gorgonio Pass, near lat. 33° 40′, at the east base of the San Jacinto Mountains, eight miles south of Indio Station, and about the level of the former lake (or sea), among granitic rocks. There is a limestone bed a little higher up near which they may be found living. Like all found, so far, except Gabb's var. *Lohrii*, they were dead shells, but retained the band, which was faded out in Newcomb's type, as described by him. For this reason, doubtless, their identity was not recognized by Gabb at first, and Dr. Yates also added a synonym or variety in describing Dr. Bowers' shell, as "*H. carpenteri* var. *Indioensis*" in Nautilus, vol. iv, p. 63, 1890. It is also reported with some doubt from "Guadelupe Island, Dr. Palmer" (Binney), who got only young shells, while Bryant found only *H. carpenteri*, but in perfect condition.

21. H. (RUFOCINCTA?) FACTA Newcomb, 1864. Santa Barbara Island, lat. 33° 30′, and San Nicolas Island J. G. C. (types), the large forms from Catalina Island, lat. 33° 20′ "Guadelupe Island, lat. 29°" *Palmer*, *Dunn.* Some of these are subangled and umbilicate. Through *H. gabbi* Newc., and some fossil forms, all are closely connected.

22. H. STEARNSIANA Gabb, 1867. El Rosario, lat. 29° 55′, to San Tomas, lat. 31° 35′, *Gabb*, on west slope only. Coronado Island, lat. 32° 25′, *Hemphill.* Near San Diego, *Orcutt.* A connecting link between the typical *H. kellettii* and those northward, considered varieties of that species. Mr. Gabb's most southern locality seems to fix the southward range definitely.

23. H. TRASKII Newcomb, 1861, and var. CARPENTERI Newc., 1861. Los Angeles, lat. 34°, (type) *Trask*, to Point Conception, lat. 34° 25′, *Yates*, and San Diego, lat. 32° 40′, *J. G. C.* The variety from Tulare Valley, lat. 36°, (type), to Coronados Island, *Dunn*, lat. 32° 25′, and Guadelupe Island, *Bryant*, lat. 29°. The "*H. remondii*" Gabb (not Tryon, 1863), scarcely differs

from *H. carpenteri*, and extends from Trinidad, lat. 28° 45′, on west coast, to Mulejé, lat. 26° 52, on east, also "Guaymas, Sonora, Mex.," Gabb. The Mexican form is, however, different, and is Tryon's type, while the peninsula shells are probably all *carpenteri*.

24. H. TUDICULATA Binney, 1843. Not far south of the boundary line, *Orcutt*. North to lat. 37°, in Sierra Nevada. "Petaluma, California," *Stimpson*, (Gould) is an error in identification.

25. H. (VANCOUVERENSIS Lea, 1839), var. SPORTELLA Gould, 1846. Near the boundary line, *Orcutt*. Those found near San Diego seem to me as near the typical Oregon shell of Lea. *H. vellicata* Forbes "Panama," seems externally very similar, and is united with it by Binney. Not being confirmed from Panama, it forms another proof of the errors in localities due to Kellett and Wood. Mr. Hemphill has lately described the smaller form found south to Ensenada as var. *transfuga*.

26. LIMAX HEMPHILLI W. G. B., 1890. San Diego Mountains to San Tomas, lat. 31° 35′, *Hemphill* (and to lat. 31°? *Orcutt*). This is the species mentioned by me in the Proc. Cal. Acad. Sci., 2d ser., I, p. 13, 1887, at bottom, as perhaps *L. agrestis* Linn. In the "4th Supplement to 5th vol. Terr. Moll.," January, 1892, Mr. Binney now states that this species is found from British Columbia to Lower California, having been confounded, in some cases, with *L. campestris*. An extreme southern form has also been named var. *pictus* by Cockerell. *Anadenus cockerilli* Hemphill, another slug allied to the northern *Ariolimax*, discovered on the San Diego Mountains just north of the boundary, may extend southward.

27. LIMNOPHYSA HUMILIS Say, 1822. Ensenada, lat. 31° 51′, *Orcutt*. Also found in nearly all the United States (and Europe?).

28. PHYSA GABBI Tryon, 1863. Found near middle of west coast of peninsula, *Bryant*, thence north throughout southern half of California. By many called a var. of *P. heterostropha* Say, 1817.

29. P. DIAPHANA Tryon, 1865. In brook at San José del Cabo, *Bryant*. Has same range northward.

P. elata Gould, described as from "Lower California, Maj. Rich," was doubtless from Mazatlan only, as given in Carpenter's Catal. The same applies to *P. aurantia* Carpenter.

"*P. heterostropha* Say," 1817, is said by Stearns to be from "Hot Springs, Lower California, *Orcutt.*"

30. PUPA CALAMITOSA Pilsbry, 1889. San Tomas, lat. 31° 35′, *Hemphill.* (To lat. 31°? and San Diego, *Orcutt.* Two species are mentioned by Orcutt without specific names, probably this and *P. hemphilli.*)

31. P. CHORDATA Pfeiffer, 1856. Sinaloa, Mex., near lat. 26°? (type). San Quintin Bay, lat. 30° 24′, "on salt marsh," *Orcutt.* In habits is a link towards *Melampus* and *Pedipes.* From ability to bear salt, it can inhabit the driest zone.

"*P. orcutti* Pilsbry," named by Orcutt, in the West Amer. Scientist, October, 1891. p. 270. is probably a synonym of *P. chordata,* as I find no other notice of such a species.

32. P. HEMPHILLI Sterki, 1890. San Diego to San Tomas, *Hemphill.*

33. P. OVATA Say, 1822. Across the continent in nearly every State. San Diego south to lat. 31°, *Orcutt.*

34. RHODEA CALIFORNICA Pfeiffer, 1846. "Monterey, California," (Pfeiffer), certainly an error. Bogota, New Grenada, *T. Bland.*

Subsp. RAMENTOSA J. G. Cooper, 1891. Mountains north of San José del Cabo, one dead shell in a cave, *Bryant.* It may prove to be now extinct.

35. SUCCINEA OREGONENSIS Lea, 1841. Oregon, (types) and south to lat. 31°, *Orcutt.* Also Vancouver Island, *G. W. Taylor.*

36. VERONICELLA OLIVACEA Stearns, 1871. Nicaragua, west slope, *McNeil* (types). Lower California, *Hemphill.* "Lobitos Creek, California, lat. 36° 52′," *Stearns.* This locality has been recently searched for them in vain by Raymond (1891).

This fresh-water slug leads to the salt-water pulmonate Onchidellas, etc., which I merely catalogue, as nothing new is to be said of them; referring to Binney's work for further information, they being beyond the scope of this article. I add also three non-pulmonates that belong to a genus sometimes inhabiting fresh or brackish water in estuaries.

"*Zonites diegoensis*" Hemphill, 1892, a minute *Helicoid,* from Cuyamaca Mountains, at 4,500 feet altitude, east of San Diego may also be looked for southward.

B. Marine Species. 1. Pulmonate.

Melampus olivaceus Carpenter, 1857. Mazatlan, Mexico, to Monterey Bay, California, lat. 23° to 36° 30′, salt marshes.

Onchidella carpenteri W. G. B., 1860. Cape St. Lucas, *Xantus*. Doubtfully reported from lat. 48° north.

Pedipes liratus W. G. B., 1861. Cape St. Lucas, *Xantus*, to San Diego, *J. G. C.*

P. unisulcatus J. G. Cooper, 1867. San Pedro, California (types). Head of Gulf of California, *Palmer*.

Siphonaria æquilirata Carpenter, 1867. Margarita Island, lat. 24° 20′, to South America (Carpenter).

S. lecanium Philippi, 1846. Cape St. Lucas to Acapulco, Mexico (Carpenter).

2. Estuarine. Non-Pulmonate, operculate.

Neritina californica Reeve, 1845. Gulf of California.

N. cassiculum Sowerby, 1832, is supposed by Carpenter to have been obtained at "San Miguel, lat. 29°, Lower California," by Lieut. Greene, U. S. N., also Mazatlan, Mexico.

37. Neritina picta Sowerby, 1832. Panama, *Cuming*. North to Guaymas, lat. 28°, on gulf coast, and Magdalena Bay, lat. 23° 30′, on west coast of peninsula, in brooks near the sea. This scarcely deserves to rank as a fresh-water shell, as it always occurs near tide-water and must travel through the sea along the coast. The habits of the other two species have not been recorded, but some are known to be entirely marine, others also found in fresh water.

Mr. Binney also includes among "Land and Fresh-water" shells the *Truncatellas*, which are allied to some land genera, but wholly marine, so I omit them here.

C. Colorado Desert Mollusca.

Very little is known of the Land and Fresh-water species east of the peninsula mountains and north of lat. 31°, but the region is known to share in the arid and barren characters of the desert north of the boundary with scarcely any fresh water, a minimum of rain, and consequently a barren soil. Prof. Blake, Mr. Orcutt and

others have, however, traced the same species so common as fossils in the desert, along New River, and they no doubt exist, sub-fossil if not all living, to the mouth of the Colorado River, or to tide-water, near lat. 32°.

38. AMNICOLA LONGINQUA Gould, 1855. *Living* at Lake Point, Utah, *Hemphill*. *Quaternary*, Nevada to Colorado Desert.

39. ANODONTA (NUTTALIANA) CALIFORNIENSIS Lea, 1852. *Living*, British Columbia to Arizona, Colorado River, *J. L. Leconte*, etc.

40. GNATHODON MENDICUS Gould, 1851. *Living*, Colorado estuary, *Dr. J. L. Leconte*, to Mazatlan, Mexico, in brackish water, *Reigen*.

41. HELISOMA AMMON Gould, 1855. Klamath Lake, Oregon, to Colorado Desert, (and river, *J. G. Cooper*).

42. PHYSA HUMEROSA Gould, 1855. Pyramid Lake, Nevada, to Colorado River, and Texas, *Blake*, *Webb*, etc.

43. PLANORBIS GRACILENTUS Gould, 1855. Colorado Desert, *Dr. T. H. Webb*. *P. leibmanni* Dunker, 1844,? from Vera Cruz, Mexico, is supposed by Binney to be the same species, and identified from Texas also. No confirmation of the desert locality recently.

44. TRYONIA CLATHRATA Stimpson, 1865. Colorado Desert, fossil only? *W. P. Blake*. Lately reported as living in Utah, (Stearns.)

45. T. EXIGUA Conrad, 1855. *Living*, southern Utah (to Dos Palmas Springs, lat. 33° 30′, Colorado Desert, *Orcutt*).

All the above except 40 and 43, are found in vast nnmbers around the shores of the dry lake constituting the desert, as fossils, Quaternary, or later. These are chiefly of more northern species than most of the peninsula shells, Nos. 40? and 43 only, being now limited to the south of the boundary, and are all aquatic. Only 41, 42, 43 are pulmonate, the others being of orders not represented on the peninsula.

The portion of the desert south of the boundary is a triangular tract about 70 miles along the boundary, and 130 along the 115th meridian (which are nearly at right angles), the third side at foot of the mountains being about 150 miles long, and ending near lat. 31°, thus embracing about 4,550 square miles. A large part of this

is a barren saline plain. The mountains west of it are less barren, and must contain some of the species reported from the region westward, near the ocean. No. 20 probably exists there also, as it extends into California, Arizona, and on the peninsula. (See notes on it.)

In reviewing this catalogue we find the terrestrial species to be thirty-two, of which fourteen are found on both sides of the boundary line. The fresh-water species are but eleven (or twelve counting No. 37), and all but this and perhaps 36 cross the boundary. Thus there remain, not found northward, eighteen land species, and one or two fresh-water.

Those also found on the east side of the gulf, or further south, are four or five land and four fresh-water. The total number given, including marine, is fifty-three, of which fourteen are considered peculiar to the peninsula, and two are reported as Chilian also (included in those more southern). Of the peculiar forms eight are Bulimoid, and four Helicoid. The derivation of these, peculiar to the peninsula, will in future be an interesting subject for investigation.

In referring to Lower California as "the Peninsula" it is most correct to include in it only the regions south of the mouth of the Colorado River, about lat. 31° 30′, which excludes the Desert species and also Nos. 15, 18, 24, 25, 26, 27, as their range is now known.

The local distribution of the species depends on latitude, altitude and exposure to the gulf on the east, or the ocean on the west. The gulf having heated water and tropical marine mollusca, besides having its shore protected from the ocean winds by high mountains, shows the greatest number of tropical species on land, the same species sometimes extending four or five degrees of latitude farther north than on the west coast. It is doubtful if any but Helicoid species are found on the west coast north of lat, 25°, while those of the east coast are mostly Bulimoid. Nos. 20 and 23 are the most southern of the former on east side, at lat. 26° 52′, about 280 miles north of Cape St. Lucas. Very much yet remains to be learned regarding distribution of the species.

The most remarkable instance of peculiar distribution is that of the three or four species inhabiting Guadelupe Island, on which we might expect a much larger number to occur, judging from most

other islands, especially those nearer the coast northward, except Cedros Island, which furnishes but one, while Coronados Islands have two, and the Santa Barbara group two to seven each, of which nearly all are absent from the main land. Guadelupe, 100 miles off shore, and volcanic, has been stocked by chance importations from the latter group (No. 21), the peninsula (1, 23, 20?), and the last three are the only species said to be common to the peninsula and the main land of Mexico. The relation of these facts to the distribution of the species, may be perhaps explained by the small shells most easily adhering to birds roosting on the ground.

MARIPOSA COUNTY AS A BOTANICAL DISTRICT.

II.

BY J. W. CONGDON.

In mentioning in the former article the shrubs forming the bulk of the chaparral of the wooded foothills, the Christmas Berry *(Heteromeles arbutifolia)* was accidentally omitted. Its abundant and beautiful bunches of red berries are very noticeable, in the winter, on nearly all our hillsides.

In discussing the herbaceous vegetation of this zone, it has seemed to me, that instead of giving a mere enumeration of peculiar or interesting plants, there would be some real scientific value in a somewhat detailed comparison of its flora with the flora of the corresponding portion of the Coast region. I include under the latter designation the territory between the Coast line and the western edge of the San Joaquin plain, with the Bay of Monterey for its southern and Mendocino County for its northern boundary.

Perhaps the most interesting and significant result of such a comparison is the great number of common species found in these tracts separated from each other by the wide expanse of the San Joaquin plain, here of an average width of at least forty-five miles. This intervening plain has a vegetation of its own, consisting of the most common Californian types, mingled with a few peculiar forms limited to that region, and it therefore constitutes with its western boundary of the interior Coast Range a real interruption of the continuous distribution of the great majority of these common species.

In the annexed list of species common to these two districts, introduced plants are indicated by putting the specific name in italics. P, denotes that the plant is also found on the San Joaquin plain; C, denotes that it extends up into the Coniferous zone; and S, that it reaches the Subalpine region.*

Clematis ligusticifolia Nutt. C.
  lasiantha Nutt.
Thalictrum polycarpum Wats. C.
Ranunculus aquatilis L. P.
  Californicus Benth. C.
  hebecarpus H. & A. P.
Aquilegia truncata F. & M. C.
Delphinium hesperium Gray. C.
  variegatum T. & G. P.
Berberis repens Lindl. C.
Platystemon Californicus Benth. P.
Platystigma Californicum Benth. & Hook.
Meconopsis heterophylla Benth. P.
Eschscholtzia Californica Cham. P.
Dendromecon rigidum Benth. C.
Dicentra chrysantha, H. & A.
Cardamine oligosperma Nutt.
Arabis perfoliata Lam.
Erysimum asperum DC. C. S.
Sisymbrium *officinale* Scop. P.
  canescens Nutt. C.
Barbarea vulgaris R. Br. (Clearly native.)
Tropidocarpum gracile Hook. P.
Capsella *Bursa-pastoris* Moench. C. P.
Lepidium nitidum Nutt. C. P.
Thysanocarpus curvipes Hook. P.
  laciniatus Nutt.
  pusillus Hook.
Helianthemum scoparium Nutt. Chemisal.
Silene *Gallica* L. P.

*Nearly all the localities and habitats given in these articles are derived from the personal observations and knowledge of the writer. When the fact is otherwise, the authority relied upon will be given.

Silene Californica Durand. C.
Stellaria *media* L. P. C.
nitens Nutt. P.
Arenaria Douglasii T. & G.
Californica Brewer.
Calandrinia Menziesii Hook. P. C.
Claytonia perfoliata Don. P. C.
exigua T. & G.
Montia fontana L.
Hypericum concinnum Benth. (Abundant with chemisal.)
anagalloides C. & S. C. S.
Malva *borealis* Wallman. P. C.
Sidalcea malvæflora Gray. C.
humilis Gray. P.
Geranium Carolinianum L. C.
Erodium *cicutarium* L'Her. P. C.
moschatum L'Her. P.
Botrys Bertolini. (Becoming very abundant.)
Limnanthes alba Hartweg. P.
Oxalis *corniculata* L. P.
Rhamnus crocea Nutt.
Californica Esch.
var. tomentella Wats.
Ceanothus sorediatus H. & A. Chemisal.
divaricatus Nutt. C.
cuneatus Nutt. C.
Vitis Californica Benth. P.
Æsculus Californica Nutt. C.
Acer macrophyllum Pursh. C.
Rhus diversiloba T. & G. C.
aromatica Ait.
var. trilobata Gray.
Lupinus Chamissonis Esch. C.
rivularis Dougl. C.
albicaulis Dougl. C. S.
nanus Dougl. P. C.
micranthus Dougl. P. C.
var. bicolor Wats. C.
leptophyllus Benth.

Lupinus densiflorus Benth. P. C.
Trifolium Macræi H. & A. P.
gracilentum T. & G.
ciliatum Nutt. C.
involucratum, Willd. P. C.
tridentatum Lindl. P. C.
pauciflorum Nutt. C. S.
microcephalum Pursh.
depauperatum Desv.
Melilotus *parviflora* Desf. P.
Medicago *sativa* L. P.
denticulata Willd. P. C.
Hosackia gracilis Benth.
strigosa Nutt. P.
parviflora Benth.
Purshiana Benth. P. C.
subpinnata T. & G. P.
brachycarpa Benth. P.
glabra Torr.
Psoralea orbicularis Lindl. C.
macrostachya DC. C.
Vicia Americana Muhl. and vars. C.
Prunus subcordata Benth. C. S.
demissa Walp. C. S.
Nuttallia cerasiformis T. & G.
Rubus ursinus C. & S. C.
Potentilla glandulosa Lindl. C.
Horkelia Californica C. & S.
Adenostoma fasciculatum H. & A.
Alchemilla arvensis Scop. P.
Rosa Californica C. & S. C.
Heteromeles arbutifolia Brewer.
Saxifraga integrifolia Hook. C. S.
Tellima heterophylla H. & A. (Mostly form with entire petals.)
affinis Boland.
Heuchera micrantha Dougl. C.
Ribes Menziesii Pursh. C.
Cotyledon farinosa Benth. & Hook. C.
Lythrum alatum Pursh. var. linearifolium Gray. C.

Zauschneria Californica Presl. C. S.
Epilobiun coloratum Muhl. var. occidentale Wats. C. S.
 paniculatum Nutt. C.
Œnothera biennis L. var. grandiflora Lindl.
 graciliflora H. & A. P.
 dentata Cav. C.
Godetia lepida Lindl. and vars. C. S.
 viminea Spach.
Clarkia elegans Dougl.
Boisduvalia densiflora Wats. P. C.
Mentzelia lævicaulis T. & C.
Megarrhiza Californica Torr. P. ?
Mollugo verticillata L. P.
Bowlesia lobata Ruiz & Pav.
Eryngium petiolatum Hook. var. armatum Wats.
Sanicula Menziesii H. & A.
 bipinnatifida Dougl. P.
Carum Gairdneri Benth. & Hook. C. S.
Œnanthe Californica Wats. C.
Peucedanum utriculatum Nutt. P.
 macrocarpum Nutt.
 dasycarpum T. & G.
Daucus pusillus Michx. P.
Aralia Californica Wats. C.
Sambucus glauca Nutt. C.
Symphoricarpus racemosus Michx. C.
Lonicera hispidula Dougl.
Cephalanthus occidentalis L. P.
Galium Aparine L.
Valerianella (Plectritis) congesta Lindl. C.
 Californica Gray.
Brickellia Californica Gray.
Gutierrezia Euthamiæ T. & G.
Grindelia robusta Nutt. var. rigida Wats. P.
Lessingia Germanorum Cham.
 leptoclada Gray. C.
Solidago occidentalis Nutt. P.
 Californica Nutt. C.
Aster Chamissonis Gray. C.

Erigeron foliosus Nutt. var. stenophyllus Gray. C.
Philadelphicus L. C. S.
Canadensis L. P. C.
Bigelovia arborescens Gray. (Chemisal.)
Micropus Californicus F. & M. P.
Psilocarphus tenellus Nutt. P. C.
Stylocline gnaphalioides Nutt.
Filago Californica Nutt.
Anaphalis margaritacea B. & H.
Gnaphalium decurrens Ives. C.
Sprengelii H. & A.
microcephalum Nutt. C.
palustre Nutt. P. C.
Xanthium *strumarium* L. P.
spinosum L. P. C.
Wyethia helenioides Nutt.
Helianthella Californica Gray. C.
Helianthus *annuus* L. P.
petiolaris Nutt. P. C.
Californicus DC. C.
Leptosyne Stillmani Gray.
Madia elegans Don. P. C.
sativa Molina var. typica. C.
var. racemosa. C.
var. dissitiflora. C.
filipes Gray. P. C.
Hemizonia Fitchii Gray.
pungens T. & G. (Waif.) P.
multiglandulosa Gray. P. C.
var. villosa. C.
Lagophylla ramosissima Nutt.
Layia gaillardioides H. & A. C.
Achyrachæna mollis Schauer.
Bæria gracilis Gray. P.
uliginosa Gray. P.
Eriophyllum confertiflorum Gray. C.
cæspitosum Dougl. C. S. Alpine.
Rigiopappusleptocladus Gray. P.
Achillea millefolium L. C. S.

Anthemis *Cotula.* C. P.
Matricaria *discoidea* DC. P.
Artemisia Ludoviciana Nutt. C. S.
dracunculoides Pursh. C.
Senecio *vulgaris* L. P.
Douglasii DC. P. C.
aronicoides DC. C. S.
Cnicus Californicus Gray? C. S.
Centaurea *solstitialis* L. P.
Melitensis L. P.
Microseris aphantocarpha Gray. P.
Bigelovii Gray. P.
linearifolia Gray. C.
Stephanomeria paniculata Nutt.
Rafinesquia Californica Nutt.
Hypochæris *glabra L.*
Troximon grandiflorum Gray. C.
heterophyllum Greene. P.
Hieracium albiflorum Hook.
Sonchus asper Vill. P.
Arctostaphylos tomentosa Dougl. C.
pungens HBK. C. S.
Dodecatheon Meadia L. C. S. Alp.
Fraxinus Oregana Nutt.
dipetala H. & A.
Apocynum cannabinum L.
Asclepias Mexicana Cav. (fascicularis Decaisn). P. C.
vestita H. & A. P.
Collomia gracilis Dougl. P. C.
Gilia pusilla Benth. var. Californica Gray. P. C.
dichotoma Benth.
micrantha Steud.
androsacea Steud.
tenella Benth. P.
cotulæfolia Steud. C.
intertexta Steud. C.
achilleæfolia Benth. P. C.
tricolor Benth. P.
inconspicua Dougl. C.

Nemophila aurita Lindl.
maculata Benth. P.
insignis Dougl. P. C.
Menziesii H. & A. P.
parviflora Dougl. P. C. S.
Phacelia circinata Jacq. f. C. S.
tanacetifolia Benth. P.
Emmenanthe penduliflora Benth.
Eriodictyon glutinosum Benth.
Heliotropium Curassavicum L. P.
Amsinckia spectabilis F. & M. P. C. Y.
intermedia F. & M. P.
Krynitzkia Californica Gray. P. C.
oxycarya Gray. P. C.
Plagiobothrys rufescens F. & M. P.
canescens Benth. P. C.
Pectocarya linearis DC. P.
Convolvulus luteolus Gray.
occidentalis Gray.
Cuscuta Californica Choisy. P. C.
subinclusa Dur. & Hilg. C.
Solanum nigrum L. P.
umbelliferum Esch.
Nicotiana Bigelovii Wats. P.
glauca Graham.
Scrophularia Californica Cham. C.
Collinsia bicolor Benth.
parviflora Dougl. P. C.
Penstemon breviflorus Lindl.
Mimulus Douglasii Gray. P.
glutinosus Wendl.
cardinalis Dougl. C.
luteus L. P. C.
pilosus Watson. C. P.
Veronica peregrina L. P.
Castilleia foliolosa H. & A. (Chemisal.)
parviflora Bong. C.
Orthocarpus attenuatus Gray. P.
purpurascens Benth. P.

Orthocarpus erianthus Benth. P.
Cordylanthus filifolius Nutt. C.
  pilosus Gray. C.
Pedicularis densiflora Benth.
Aphyllon fasciculatum Gray. C.
  Californicum Gray.
Monardella villosa Benth.
Pogogyne Douglasii Benth. P. C.
  serpylloides Gray. P.
Sphacele calycina Benth.
Salvia Columbariæ Benth.
Scutellaria angustifolia Benth.
  tuberosa Benth.
Marrubium *vulgare* L. P. C.
Stachys albens Gray. C.
Trichostema lanceolatum Benth. P.
Plantago *major* L. P. C.
  lanceolata L. C.
  Patagonica Jacq. P. C.
Rumex salicifolius Weinm P.
  crispus L. P. C.
  conglomeratus Murr. C.
  Acetosella L. P. C.
Polygonum *erectum* L. P. C.
  aviculare L. P. C.
  nodosum Pers.
  Persicaria L. P. C.
  Convolvulus L. C.
Eriogonum nudum Dougl. C. S.
  virgatum Benth. P. C.
  vimineum Dougl. P. C. S.
Lastarriæa *Chilensis* Remy. P.
Pterostegia drymarioides F. & M. P. C.
Amarantus *retroflexus* L. P. C.
  paniculatus L. C.
  albus L. P. C.
  blitoides Wats.
Chenopodium *album* L. P. C.
  murale L. P. C.

Chenopodium leptophyllum Nutt. P.
Botrys L. P. C.
ambrosioides L. P. C.
Umbellularia Californica Nutt. C.
Urtica holosericea Nutt. P. C.
urens L. P.
Eremocarpus setigerus Benth. P. C.
Euphorbia serpyllifolia Pers. P.
leptocera Engelm. C.
Callitriche verna L. P. C.
Alnus rhombifolia Nutt. C.
Salix nigra Marsh. P. C.
longifolia Muhl. P. C.
lævigata Bebb. P.
lasiolepis Benth. P. C.
Populus Fremontii Wats. P.
Quercus lobata Née. C.
Douglasii H. & A.
chrysolepis L. C.
Kelloggii Newberry. C.
Phoradendron flavescens Nutt.
Juniperus Californica Carr.
Pinus Sabiniana Dougl.
Sisyrinchium bellum Wats.
Allium attenuifolium Kell.
Brodiæa capitata Benth. P. C. S.
laxa Wats. C.
ixioides Wats. C.
lactea Wats.
Chlorogalum pomeridianum Kunth. C.
Fritillaria biflora Lindl.
lanceolata Pursh, *var.* floribunda Benth.
atropurpurea Nutt. C.
Calochortus albus Dougl.
luteus Dougl.
venustus Benth. C. S.
Lemna minor.
Zannichellia palustris L.
Potamogeton pauciflorus Pursh.

Luzula comosa Meyer. C. S.
Juncus Leseurii Boland. P.
effusus L. C.
bufonius L. P. C.
tenuis Willd.
Carex marcida Boott. C. S.
glomerata Thunb.
angustata Boott. C.
Panicum *sanguinale* L. P. C.
dichotomum L. C.
crus-galli L. P.
Phleum *pratense* L. P.
Polypogon *Monspeliensis* Desf. P. C.
littoralis Smith. P. C.
Agrostis *alba* L. P. C. S. Native. S.
scabra Willd. C. S.
Gastridium australe Beauv. P. C.
Stipa setigera Presl. C.
eminens Cav.
viridula Trin. C.
Avena *fatua* L. P. C.
Aira danthonoides Trin. C. S.
Holcus *lanatus* L. P. C.
Melica imperfecta Trin. C.
var. refracta Thurb.
bulbosa Geyer. C.
Atropis tenuifolia Wats. C.
Poa annua L. P. C.
Poa pratensis L. P. Native. C. & S.
trivialis L. C. Apparently native.
Festuca *Myurus* L. P. C.
microstachys Nutt. P. C.
Bromus *maximus* Desf. P. C.
rubens L. P. C.
secalinus L. P. C.
racemosus L. P. C.
Ceratochloa *unioloides* Beauv. P.
Lepturus Bolanderi Thurb.
Hordeum *nodosum* L. C.

Hordeum *murinum* L. P. C.
Elymus condensatus Presl. C.
    Sibiricus L. C. S.
    Sitanion Schult. P. C.
Polypodium vulgare L. C. S.
Gymnogramme triangularis Kaulf. C. S.
Pellæa andromedæfolia Fee. C.
    Ornithopus Hook. C.
Pteris aquilina L. C.
Woodwardia radicans Sm. C.
Aspidium rigidum Sm. C. S.
    munitum Kaulf. C.
Cystopteris fragilis Bernhardi. C. S.
Selaginella rupestris Spreng. C. S.
Azolla Caroliniana Willd. P.

This list shows that out of 318 native species common to this district and the coast, as above defined, only 105, or about one-third, are found in the intervening plain. It is possible, but not probable, that a more thorough exploration of the plains would add something to the number of the species found there, but could hardly produce any serious change in the ratio. On the other hand, out of the 66 naturalized plants enumerated, 59 are pretty certainly found on the plains, showing that they have accompanied the successive waves of immigration which first swept over the foothills in the search for gold, but have now largely flowed back upon the plains, seeking the agricultural treasures of the soil.

A further examination of the same list shows how rapidly the plants of the plains and lower foothills disappear as we ascend into mountains. Of the 105 plants of the plains found in this zone, only 37 reach the coniferous belt and only three the subalpine district. Probably there are really only two of these, as *Achillea millefolium* is pretty certainly naturalized on the plains, having been introduced with grass seed. Out of the 213 remaining species 115 extend into the coniferous belt, of which 27 reach the subalpine region. Two of these, *Dodecatheon Meadia* and *Eriophyllum cæspitosum*, attain the alpine summits in some of their varieties which, however, may yet be specifically distinguished from the lower forms.

Coming now to the species really characteristic of or limited to

the foothills, which are found in this zone, so far as they are known to me, they will be found in the next list, which follows the same rule as the former one, except that items of supposed interest in regard to rare or new species are more freely introduced.

Isopyrum occidentale H. & A. Shaded hillsides. Mariposa.
Delphinium decorum F. & M., var. patens Gray. Same localities. C.
Arabis arcuata Gray. Face of cliffs. Mariposa. Hite's Cove. C.
Streptanthus barbatus Wats.? Sepals not bearded. Rocky places. Mariposa. Agua Fria.
polygaloides Gray. Rocky sidehills. Mariposa.
Nasturtium palustre DC. Banks Lower Merced.
Lepidium Menziesii DC. The common species here.
Thysanocarpus radians Benth. Hornitos.
Viola aurea Kell. The only yellow violet proper here. C. S.
chrysantha Hook. This beautiful representative of the *tricolor* type is not rare in open grassy places in March.
Polygala Californica Nutt. Rocky cliffs. Merced River.
Hypericum Scouleri Hook. Stream banks. C.
Sidalcea Hartwegi Gray. Thickets and open grounds.
Fremontia Californica Torr. Chaparral-covered hillsides. May. C.
Linum micranthum Gray. Rocky places.
Trifolium bifidum Gray. Differs from *T. gracilentum* in its strictly upright growth. Open woods.
Hosackia stipularis Benth. Chemisal. Agua Fria.
grandiflora Benth. Shaded spots. Mariposa. April and May.
Hosackia argophylla Gray. Cliffs. Hite's Cove.
Astragalus Congdoni Wats. Chemisal. Hite's Cove.
Lathyrus sulphureus Wats. Thickets and stream banks. Common. C.
Cercis occidentalis Torr. Rocky places. A white variety occurs. March and April.
Cercocarpus parviflorus Nutt. Frequent. March.
Calycanthus occidentalis W. & A. Rocky beds of streams. Hite's Cove, etc. C.

Saxifraga Parryi Gray. Rocky banks of Merced River and vicinity of Benton Mills. This is an interesting link between our flora and that of the extreme southwestern coast of the State.

Philadelphus Lewisii Pursh. Rocky banks of streams. Frequent.

Ribes leptanthum Gray. Rocky places, descending almost to the plains. December to March.

Sedum obtusatum Gray. Rocks. Not rare. C.

pumilum Benth. Rocks near Hornitos and Mormon Bar. March and April.

Epilobium minutum Lindl. Wooded places. Common.

Godetia. A form classed by Watson as a var. of *epilobioides*, but clearly different. Thickets. Common. C.

epilobioides Wats. Rocky places. Not rare.

biloba Wats. North hillsides. Mariposa.

Boisduvalia Torreyi Wats. Stream beds. Mariposa. Frequent.

Heterogaura Californica Rothr. Shady rocky places. Frequent. C.

Datisca glomerata B. & H. Banks of streams. Frequent.

Mentzelia dispersa Wats. Shady hillsides. Mariposa. Occasional.

Lindleyi T. & G. Cliffs. Hite's Cove. March.

Cucurbita perennis Gray. Occasional. Perhaps introduced near the plains.

Sanicula bipinnata H. & A. Rocky places. Common.

tuberosa Torr. Shady hillsides. March and April.

Deweya Hartwegi Gray. Cliffs. Hite's Cove, Benton Mills, etc. April.

Osmorrhiza brachypoda Torr. Woods. Common. C.

Podosciadium Californicum Gray. Rocky beds of streams. White's Gulch. May.

Peucedanum caruifolium T. & G. Rocky places. Common.

Ferula dissoluta Wats. Rocky places. Mariposa, Agua Fria, etc. April.

Caucalis microcarpa H. & A. Dry rocky places. Common.

Cornus glabrata Torr. Banks of streams. Scarce.

Galium Bolanderi Gray. Thickets. Everywhere. C.

Pentachæta exilis Gray, *var.* discoidea Gray. Open grassy places. March and April.

Lessingia nana Gray. Open grassy ground. Mariposa. August and September.

Corethrogyne filaginifolia Nutt, *var.* tomentella Gray. Hite's Cove. October and later.

Stylocline filaginea Gray. Benton Mills. April.

Evax caulescens Gray. Clayey ground. Common.

Balsamorrhiza Bolanderi Gray. Dry summits of chaparral-covered hills. Bear Valley Mt., etc. April.

Wyethia, related to *W. angustifolia*, and referred to under that species in Bot. Cal. Dry woods. C.

Hemizonella Durandi Gray. Dry ground. Benton Mills, etc. C.

Hemizonia virgata Gray. Is *the* tar weed, here, covering all the open grounds in August and September.

Wrightii Gray. Adventive from below, especially near the plains.

mollis Gray. Open grounds. Most common near and in the coniferous belt. C.

truncata Gray. Rocky sidehills. Mariposa.

Lagophylla glandulosa Gray. Open clayey grounds and roadsides. Mariposa and vicinity. May to December.

filipes Gray. Rocky beds of streams. Gaudalupe mountain, etc. May—July.

Layia Fremontii Gray. Open grassy places towards the plains. March.

Bæria debilis Greene. Shade of chaparral bushes. Lewis'. April.

Chænactis glabriuscula DC. Clayey soils. Frequent.

Helenium Bigelovii Gray. Rocky beds of rivers. Benton Mills and above. C. S.

Troximon retrorsum Gray. Shaded hillsides. Mariposa, and more common in the zone above. C. S.

Nemacladus ramosissimus Nutt. Rocky soils, nearly the same range as the last. C.

Githopsis specularioides Nutt. Wooded hillsides. Common.

Heterocodon rariflorum Nutt. Rocky and wet places. Not rare.

Arctostaphylos glauca Lindl. Mariposa. More common here than *A. pungens*, which grows principally higher up.

Gomphocarpus tomentosus Gray. Rocky hillsides. Benton Mills, etc.

cordifolius Benth. Open thickets. Common.

Asclepias speciosa Torr. Open grounds. A rather showy species. More common in the next zone. Stockton, etc. C.

Erythræa venusta Gray. Water courses. Frequent. More abundant in the zone above. C.

Gilia Bolanderi Gray. Open clayey grounds. Mariposa, etc. Scarce.

filicaulis Torr. Dry hillsides. Mt. Bullion, etc. Not common.

Ellisia membranacea Benth. Open rocky places near the plains.

Phacelia humilis T. & G. Rocky shaded places. Mariposa and above. C. S.

hispida Gray. Rocks. Agua Fria, etc. March.

phyllomanica Gray (or bipinnatifida). Shaded rocks. Mariposa, etc.

Plagiobothrys tenellus Gray. Moist grounds. Frequent. C.

Torreyanus Gray. Same localities. C.

muriculatus. Wooded hillsides. C.

barbigerus Gray. Open shady places. Darrah Road, etc. C.

sparsiflorus Greene. Rocky banks of streams. Mormon Bar.

Echinospermum Greenei Gray. Open grassy places. Mariposa.

Cynoglossum læve Gray. Moist hillsides. April.

Pectocarya pusilla Gray. Clayey soils near Mariposa. April.

Datura meteloides DC. Stream beds. Probably introduced from below.

Verbascum *Thapsus* L. This common eastern weed is fast becoming too frequent in Mariposa county. C.

Antirrhinum leptaleum Gray. Open and especially cultivated grounds. Mariposa and above. C.

Breweri Gray. Occasional on hillsides, near Mariposa.

Collinsia tinctoria Hartg. Wooded hillsides and stream banks. Mariposa and above. C.

Penstemon heterophyllus Lindl. Open grounds, Mariposa, etc.

azureus Benth. Higher up. Probably a form of the last. C.

Mimulus nanus Hook. & Arn. Wooded hillsides. Mariposa and above. C.

Mimulus Congdoni Robinson. Shade of buckthorn clumps. Mariposa and vicinity. March.

Torreyi Gray. Wooded hillsides and wet grounds. Mariposa and above. C. S.

Bolanderi Gray. Open clayey soils. Hite's Cove. Mariposa and above. C.

gracilipes Robinson. Rich rocky soils. Mormon Bar and above. April.

Pulsiferæ Gray. Moist grounds. Bootjack Ranch. More common above. C. S.

inconspicuus Gray. Wooded hillsides. Mariposa and above. C.

Palmeri Gray. Banks of streams. Rare near Mariposa. Occasional above. C.

floribundus Dougl. Rocky beds of streams, etc. Very frequent. C. S.

Orthocarpus Bidwelliæ Gray. Open spots in chaparral. Darrah Road.

spec. undescribed. Mariposa and above. Rocky hillsides. March.

Cordylanthus tenuis Gray. Clayey soils. Darrah Road.

Pycnanthemum Californicum Torr. Banks of streams. Mariposa and above. C.

Monardella lanceolata Gray. Open uncultivated grounds. Mariposa and above. C.

candicans Benth. Occasional in open spaces in the chaparral. Mariposa, etc.

Scutellaria Bolanderi Gray. Banks of streams. Mariposa, and more common above. C.

Trichostema oblongum Benth. Beds of streams. Mariposa Creek, etc.

Eriogonum stellatum Benth. Rocky places. Josephine Mine. More common above. C. & S.

hirtiflorum Gray. Open clayey soils. Hite's Cove. Mariposa, etc.

Chorizanthe membranacea Benth. Rocky places. Hite's Cove. Agua Fria, etc.

Hesperocnide tenella Torr. Shaded rocks. Mormon Bar, etc. April.

Euphorbia ocellata D. & H. Open clayey soils. Mariposa and below.

dictyosperma P. & M. Open hillsides. Mariposa, etc.

Quercus Wislizeni ADC. Dry wooded hillsides, almost everywhere below the evergreen belt.

Asarum Hartwegi Wats. Rocky places. Mariposa, etc. April.

Arceuthobium occidentale Engelm.? Everywhere on *Pinus Sabiniana*. C.

Pinus ponderosa Dougl. Begins here but reaches its grandest development in the zone above. C. S.

Allium hyalinum Curran. Rocky places. Mariposa, etc. April. Two weeks earlier than the associated *A. attenuifolium* Kell.

Brodiæa grandiflora Sm. Open grounds. Mariposa, etc. Frequent. May to June.

Stropholiron Californicum Torr. Climbing over the bushes everywhere from Mariposa, etc., above. The leaves die early. C.

Fritillaria atropurpurea Nutt. Shaded hillsides and deep woods. Mariposa and above. C.

Erythronium Hartwegi Wats. Shaded hillsides, principally near Mariposa. April. This is the most appropriate "Mariposa Lily."

Odontostomum Hartwegi Torr. Rocky beds of streams. Agua Fria. April and May.

Juncus Congdoni Wats. Bed of the Chowchilla, etc. April and May.

Cyperus aristulatus Roth. Beds of streams. Chowchilla and above. C.

Agrostis virescens HBK. Rocky banks of streams. Mariposa and above. C.

Cinna macroura Kunth. Rocky banks of streams. Mariposa and vicinity.

Triticum caninum L. Rocky banks of streams. Mariposa and above. C.

The 124 species above named illustrate the same fact as the former list, that the species change rapidly as we approach the mountains. Out of the whole number only 44 enter the coniferous belt, and of these only nine reach the subalpine region. Out of the 508

species enumerated in these two lists as constituting the flora of the wooded foothills, 440, or 87 per cent. nearly, are plants apparently native in the district, and about 13 per cent. are pretty certainly introduced, though some of these are native further south. Of the 440 native species 318, or a little over 72 per cent., belong also to the coast region, though only 105, or 24 per cent., occur in the intervening San Joaquin plain; while of the 122 native plants which begin to grow here, 78, or nearly 18 per cent., of the whole number are, in this county at least, limited to this zone.

NOTES ON LILIACEÆ. II.

BY CARL PURDY.

Every observing botanist recognizes the extent to which plants are influenced by surroundings. Climate, soil, exposures and moisture are factors which greatly effect the appearance of a plant, not only in a general way but also sometimes structurally.

In no country are there greater variations in natural surroundings than in California, and our flowers reflect their surroundings. It is indeed wonderful how different a species, which can be proved to be the same, will appear in different places. So different indeed that such forms are frequently given different botanical names and treated as distinct species. On the other hand it is not infrequent that careful botanists attribute to accidental circumstances a difference which really marks a variety or species. Between the extreme of considering each accidental variation a variety or species, and the other extreme of merging two distinct species under the idea that the variation is inconstant and accidental, lies a mean very difficult to obtain, and it is not surprising that so many errors have been made and obtained a stronghold in botanical works.

I suppose that no class of plants are more susceptible to the influence of surroundings than the Liliaceæ. I tried for years to satisfy myself as to whether species were distinct or not, by comparison of specimens and observations of the plants in their native homes, but I was forced to the conclusion that the only way to settle the matter was by cultivating them side by side, thus eliminating all variations due to soil and climate. This, rather than field work, is my present line of study, and carefully followed out will be, I feel sure, productive of valuable scientific results.

In this work I find two obstacles. The first is the difficulty of securing the bulbs. Of course the larger number can be obtained, but many species are only to be had by journeys to out of the way localities. It may be years before some can be secured. The cultivation of these bulbs is by no means a simple matter. It requires care and close study of conditions. I am pleased to say that I am now able to grow most species quite satisfactorily.

The problems to be solved are many. In Lilium, twelve or more species have been described from this coast. It is likely that cultivation will show the number of varieties to be much greater. In Calochortus, the field of work is large. There is much confusion here. I have no doubt but that several species will, in cultivation, prove to be identical. Here, as often elsewhere, the question arises as to what degree of variation justifies the formation of a species or variety, and how much greater the variation should be for one than the other. I should like to see this question discussed.

In the genus Calochortus it is peculiarly pertinent; since several so called varieties are as well defined as others called species, for instance, *Calochortus venustus*, *C. luteus*, and *C. luteus* var. *oculatus* and var. *citrinus*, following Botany of California, as to names. *C. luteus*, however, is a clearly defined species as to habit, gland, etc., and so is *C. venustus*, the latter much finer and larger in flower, more varied in markings and color. No one having seen either *C. luteus*, with its small flower, single color and peculiar gland, or *C. venustus*, with its markings and brilliancy, would hesitate to identify either anywhere.

Now, *C. luteus* var. *oculatus* and var. *citrinus* have the gland of *C. luteus* and that is all. In all other details their habit is that of *C. venustus*. While *C. luteus* var. *oculatus* and var. *citrinus* meet each other and cross in an interminable number of forms, I have never seen any tendency to cross with *C. luteus*. In fact, I have found the latter the least variable of species. In a field the flowers are alike, and those from far distant localities are identical. Is it not straining a point to refer two very distinct forms to a species that is invariable? To suppose them to have varied from *C. venustus* is still more of an improbability, since there are structural differences. I think they form a distinct species instead of varieties, and possibly two species.

In the genus Erythronium, botanists are still at sea, and all along the line of Liliaceæ there are interesting points to be solved.

NOTE ON HELIX YATESII Cooper.

BY HENRY HEMPHILL.

There seems to be an erroneous impression prevailing among our conchologists in regard to the habits of this interesting little mollusk that needs to be corrected. The fact that the five dead specimens—two perfect and three imperfect ones—from which Dr. Cooper drew his descriptions of the shell and his genus Ammonitella, were found in the cave at Cave City, Calaveras County, California, has led some of the writers on our West Coast shells to regard this mollusk as a rare, isolated cave dweller, that prefers the shadow and gloom of caverns in which to pass its existence, rather than the light of the outside world. This, however, is a mistake which any intelligent or close observing collector can easily determine by a visit to the cave, and a short ramble over the hills in its vicinity.

Several years ago I visited Calaveras County for the purpose of collecting this and the other shells of that region, and to my surprise I found this little mollusk near Murphy's, seven miles away from the cave, æstivating under stones on north hillsides, while numbers of dead shells lay bleaching in the sunshine, where they had fallen in the struggle for life.

Around the entrance and on the slopes of the hill in which the cave is situated, and also on the adjacent hills, it occurred plentifully, and it is not a rare shell in these localities.

On entering the cave I found but few specimens inside. Most of these I took from the crevices in the rocks on each side of the entrance within the cave, a few only being found on the floor, and none beyond a distance of fifty feet from the entrance, although I searched closely for this and other species with the aid of a good light.

When fairly within the cave, and looking towards the entrance, I could see the daylight through the crevices between the rocks on each side of the opening through which we entered, which at once revealed to me the mystery of the presence of this mollusk within this cool and shady retreat.

To those acquainted with the habits of land snails it will be readily seen how these creatures, in seeking safe and convenient places in which to hibernate and pass the long, dry and hot summer season and cold winter months, would naturally crawl into

these crevices between the shelving ledges, and finding them moist and cool, would continue their explorations until they entered the chambers of the cave; and thus having easy ingress and egress, they have no doubt continued their visits for many years, on the approach of the dry season, while some, perhaps, never leave the cave.

The fact that there are so few specimens found within the cave, and so many outside and miles away, æstivating under stones, is sufficient evidence that the presence of this mollusk within the cave is simply accidental, and that it is not its natural habitat.

In his remarks upon this shell, Dr. Cooper calls attention to its resemblance to Planorbis and Ammonite, its relations to *H.? polygyrella* and Gastrodonta, and its affinity to Macrocyclis, with all of which I agree, and which goes to show very plainly, I think, that nature does not represent any particular genus by the shell. If she indulges in such freaks as genera at all, she determines that matter by modifications of the structure of the animal, and not by the object formed or moulded by the animal itself; and this little shell, compounded of several so-called genera as it seems to be, is a good illustration of this fact.

In support of this I can do no better than repeat Dr. Cooper's own words: "It would have been supposed to be a Planorbis if found near water and if the streams in that country had not been thoroughly searched by many collectors. It resembles Planorbis in the inverted spire and in the partial enclosure of each whorl in the next larger, so that the spire shows only a small portion of the whole shell.

"The consequent vertical narrowing of the aperture, and, indeed, of the whole interior, is also found in some species of Planorbis, but not in any American Helicoid. Indeed, it is inconsistent with the character of 'Helix,' as defined by Lamarck, and this shell could not, therefore, be embraced in that most comprehensive genus. The resemblance to an Ammonite is conspicuous in a lateral view. It probably belongs to Helicellidæ, notwithstanding its thickened labrum, which we find also in *H. ? polygyrella* and *G. interna*, and some other species. Though toothless, it is apparently nearly allied to the former, in which the spire is flat and of 7 to 8 whorls. It also shows affinity to Macrocyclis in the oblique flattening of the outer whorls and its strong deflection near the mouth."

No stronger argument could be advanced to show how utterly valueless the shell is for the purpose of determining genera. Had this shell been accidentally washed into the creek below and found dead in the water as it was found in the cave, neither Dr. Cooper nor any other naturalist would have hesitated a moment to have described it as a Planorbis, which it closely resembles.

Even with the animal known, the authorities do not agree on its genera, or its position in our system of classification.

Mr. Tryon recognized Dr. Cooper's genus Ammonitella, but Mr. Binney, Mr. R. E. C. Stearns and Mr. Pilsbry, equally as good authority, refer the shell to Gonostoma.

Mr. Binney, than whom there is no better authority on these animals, says of Gonostoma: "Animal, as in Patula."

Now, if the animal is a Patula, should we not place this shell with or near the genus Patula, instead of separating it as we do now?

I do not write this in a spirit of criticism, but to draw attention to what I believe to be an error in our system of classification of these creatures, and which seems to me to be inconsistent with nature and the philosophy she teaches.

NOTES ON THE CICINDELIDÆ OBSERVED IN SAN DIEGO COUNTY, CAL.

BY F. E. BLAISDELL.

Omus. It is doubtful if any species of *Omus* occurs south of the 35th parallel. At Port Harford, San Luis Obispo County, I have taken what is probably *O. lecontei*, and I consider that locality the southern limit of distribution of the genus.

Cicindela latisignata Lec. Plentiful from May to October, on the ocean beach and alkaline flats; not found about inland streams and ponds.

Cicindela tenuicincta Schaupp. In company with the preceding form, with which it is identical. The creation of the present subspecies is ostensibly based upon the elytral markings. In *latisignata* there is an excessive increase in the white; while in *tenuicincta* there there is a close approach to the typical pattern as exhibited by *vulgaris* "the central pattern from which all forms observed in our Cicindelæ have been derived, either by a progressive spreading of the white, or its gradual absorption and fragmentation."—Horn.

From the above propositions, it is to be argued that *latisignata* has been evolved from *tenuicincta*, the latter being naturally and logically the fundamental species, the former only so by the arbitrary laws governing the priority of nomenclature.

Latisignata may be regarded as an incipient species in progress of divergence from a more normal type, and will in all probability in the course of time become isolated and perpetuated.

At the present time the two forms are to be considered as identical.

Any collector of these insects cannot fail to note the following facts while in the field:

1. That the two forms under consideration form the extremes of a series, in which the intermediate types of elytral variation are exceedingly abundant and exhaustive.

2. That the normal *tenuicincta* in numbers considerably exceed the broad-banded form, the latter being comparatively scarce.

3. That all of these forms are intimately associated.

4. That eight-tenths of the couples taken *in coitu* will represent a ♂ or ♀ of one of the extremes, with the opposite sex an intermediate.

From the above can be seen that they interbreed entensively, inhabit the same geographical region, and exist under the same environment and climatic conditions.

If any one of the forms inhabited a more or less distinct geographical district, so that it would be possible to admit of different climatic influences and environment, without constant interbreeding, the idea of races could be sustained.

Correctly and philosophically speaking, *Cicindela tenuicincta* is a fundamental species, with a strong tendency towards variation.

Cicindela obliquata Kirby. Occurs upon the borders of the Big Laguna, in Temecula Valley.

Cicindela vibex Horn. Ocean beach, near Oceanside.

Cicindela guttifera Lec. According to Schaupp's "Synopsis of the Cicindelidæ," this is the form that occurs throughout the county, about all the inland streams and ponds, as well as upon the ocean beach. In *12-guttata* the elytral markings are broken into spots. Specimens of *guttifera* taken in Arizona are quite green. This color begins to be perceptible in the specimens collected in the central portion of the county, becoming deeper as we approach the desert region and Colorado valley.

Cicindela hirticollis Say. Very abundant from June to October; varies in size without perceptible variation in elytral markings; occurs on ocean beach and alkaline flats; not inclined to inhabit the borders of inland fresh-water pools.

Cicindela sigmoidea Lec. A very abundant species, actually swarming on the bay beach during June and July. Attracted in considerable numbers by the electric light.

Cicindela gabbii Horn. Occurs in August on alkaline flats. Very desirable and not abundant.

Cicindela hæmorrhagica Lec. Occurs throughout the county. Formerly abundant about San Diego Bay, but has retreated before the advance of civilization, and at the present time is exceedingly rare.

Cicindela pacifica Schaupp. Occurs at Del Mar in August and September. From the sea-shore it extends up Peñasquitos Creek for the distance of fourteen miles to Poway (elevation 700 feet). Have not observed it at other inland points.

ADDITIONS TO THE CATALOGUE OF SAN FRANCISCO PLANTS.

BY KATHARINE BRANDEGEE.

6 *a*. RANUNCULUS BLOOMERI Gray. Bot. Cal. ii, 426. In wet adobe soil on the northern slopes and near the base of a high hill in South San Francisco. April—May.

31 *a*. *Lepidium bipinnatifidum* Desv. Jour. Bot. iii, 165. Common about roadsides and paths, South San Francisco. April—July.

47 *a*. STELLARIA LITTORALIS Torr. Pac. R. Rep. iv, 69. Bluffs above the sea at Land's End Station near Point Lobos. April—May. "Shore-Chickweed."

62 *a*. HYPERICUM SCOULERI Hook. Fl. Bor.-Am. i, 111. Lake View. April—July.

Ulex Europæus L.—"Gorse," "Furze," "Whin." This plant, native of Europe, has escaped and covers many acres near the county line, between Visitacion Valley and Ocean View. On the

bare stony hills it is low and decumbent, but in the ravines and sheltered spots it reaches 6–8 feet.

114 *a*. HOSACKIA STRIGOSA Nutt. T. & G. Fl. i, 326. Along the railway, Point Lobos. April—May.

142 *a*. TELLIMA AFFINIS (Gray. Proc. Am. Acad. vi, 534). The most common species in our limits. March—May.

153 *a*. CALLITRICHE SEPULTA Wats. Proc. Am. Acad. xiv, 298. Surface of mud about pools, Presidio. April—May.

ECHINOCYSTIS MARAH Wats. This species was supposed to be extinct within our limits, but it still persists in the gorse thickets near Visitacion Valley.

APIASTRUM ANGUSTIFOLIUM Nutt. T. & G. Fl. i, 644. Point Lobos, South San Francisco, Visitacion Valley. April—May.

204 *a*. GALIUM CALIFORNICUM H. & A. Bot. Beech. 349. South San Francisco, Visitacion Valley. April—June.

255 *a*. LAYIA CALLIGLOSSA var. OLIGOCHÆTA Gray. Fields at the upper end of Visitacion Valley. April.

285 *a*. *Cnicus arvensis* (L. spec. 1149.) About the base of Telegraph Hill. May—October. "Canada Thistle."

The spread of this plant is to be dreaded; though apt to be less troublesome in our dry climate than in the eastern states, it will be difficult to eradicate from irrigated fields and borders of ditches.

Centunculus minimus L. spec. 169. Cliffs between Lobos Creek and Fort Point, and very abundant about the Presidio in company with *Microcala quadrangularis*. April.

328 *a*. NEMOPHILA PARVIFLORA Benth. Trans. Linn. Soc. xvii, 275. Common in rocky bushy places. March—May.

329 *a*. NEMOPHILA AURITA Lindl. Bot. Reg. t. 1601. Near the northern base of a high hill in South San Francisco. April—May.

334 *a*. PHACELIA DOUGLASII (Benth. Trans. Linn. Soc. xvii, 276). Near Lake Merced. April—May.

370 *a*. ORTHOCARPUS ATTENUATUS Gray. Pac. R. Rep. iv, 121. Potrero. April.

372 *a*. ORTHOCARPUS FAUCIBARBATUS Gray. Pac. R. Rep. iv, 121. Presidio, Potrero, Visitacion Valley. April.

? EQUISETUM ARVENSE L. Marshy banks and ditch sides. Visitacion Valley.

NOTE ON A CALIFORNIAN LOLIGO.

BY HENRY HEMPHILL.

In the July (1891) number of the Nautilus, in an article under the heading "Edible Shell Notes," Mr. R. E. C. Stearns mentions a "Ten-armed Cephalopod" which he had seen offered as an article of food in the San Francisco markets. Recently, while passing through the San Francisco and Oakland markets, I found a form of a loligo lying on the stalls of the fish dealers, which they offered at twenty-five cents per pound, and which I think is the "Ten-armed Cephalopod" referred to by Mr. Stearns. Dr. Cooper informs me he had observed a shoal of loligo at Monterey, some years ago, but having no net he was unable to secure a specimen. These that we find here in the markets now are said, by the fish dealers, to be taken in nets outside the Heads by the Chinese fishermen.

The body and arms of my largest specimen measures about ten inches, the two longest arms being about three inches longer. The arms are not webbed, but each of the eight short ones have two rows of suckers their entire length, while the two other arms have a small patch of small suckers towards their tips. It took nine individuals of those I purchased from the fish dealer to weigh a pound, so we may say they weigh about two ounces each. In cleaning for cooking they will lose about half their weight, and each one will then furnish about one ounce of flesh.

In preparing them for cooking, after having removed the outer skin, pen, head, arms and entrails, they should be carefully washed, and fried in plenty of hot butter or fat, and seasoned to the taste.

Those which I had prepared and cooked were a little tough, though quite palatable, being nicely flavored, but they never will take the place of the delicious oysters and clams that have inspired poets to sing their praises.

In the form of its body and the coloring, as well as in the form of the pen, it closely resembles *Loligo Gahi* D'Orbigny, but as I have no other material with which to compare it, and no description of that form, I cannot say definitely whether it is that species or not. This form makes an interessing addition to our west coast Cephalopods, and if upon further study I should conclude it to be new I propose to call it *Loligo Stearnsii*.

The following is a list of all the Cephalopods known to our coast, from San Diego to Alaska:

ARGONAUTA ARGO L.
OCTOPUS PUNCTATUS Gabb.
AMMOSTREPHES AYRESII Gabb.
AMMOSTREPHES GIGANTEUS Gabb.
ONYCHOTEUTHIS FUSIFORMIS Gabb.

A NEW ASTRAGALUS.

BY SERENO WATSON.

ASTRAGALUS GRALLATOR n. sp. Perennial, the decumbent stems nearly two feet long, glabrous or nearly so: stipules distinct, acuminate-deltoid; leaves finely appressed-pubescent or glabrate, about 3 inches long; the narrowly oblong leaflets (about 20) 5 to 10 lines long: racemes loose, erect on peduncles exceeding the leaves; pedicels very slender, erect, 3 or 4 lines long: flowers small (3 lines long), pale rose-color or white; calyx-teeth narrow, shorter than the narrowly campanulate tube: pod (immature) 3 lines long, ascending upon a stipe nearly equalling the calyx, thin-coriaceous, nearly glabrous, transversely rugose, straight, 1-celled, at first compressed, becoming somewhat obcompressed-turgid, roundish dorsally and the ventral suture prominent.—At Steamboat Springs, Routt County, Colorado. Peculiar in its unusually long, slender pedicels, etc. In some respects it resembles species of the *Homalobi* section, but it is more nearly related to the *Bisulcati*, though the pod is not at all furrowed on the ventral side.

[The above Astragalus was found at Steamboat Springs in July, 1891, by the writer and sent to Dr. Watson for identification. It grew on the banks of a small stream in adobe soil, and has the odor of carrion peculiar to the Astragali that are found in similar localities. The flowers are white, but turn light pink in drying. It was a single plant, large and with many stems, and grew where *Astragalus Haydenianus* was very abundant. It was referred to in The Additions to the Flora of Colorada, Zoe, vol. ii, No. 3, as *A. Grayi.*

The manuscript was found by Mr. B. L. Robinson among Dr. Watson's papers and kindly sent to Zoe for publication.

ALICE EASTWOOD.]

THE LOCO WEEDS.

BY ALICE EASTWOOD.

Considering how much the loco weed has been the subject of discussions, experiments and even laws, it is surprising how little is really known about its identity, its properties and its effects. A survey of what has been done by chemists and other scientists seems only to increase the confusion. They disagree upon most important points, some asserting its poisonous character and proving it by experiments while others seem to be as positive that loco poison is a superstition of the farmer and stockman.

When a botanist tries to learn from the people of different localities which plant they regard as loco, he finds that each district has its own loco weed, and he is soon at sea amid the genera and species of Leguminosæ and also of other orders of plants. However, they all firmly believe that such a weed exists and they positively know that it destroys their cattle and horses. They will generally tell the inquirer that loco means crazy, and that when a horse becomes locoed he takes every little irrigating ditch for a river and every ant hill for a mountain.

The object of this paper is not to clear the mystery by an account of original experiments or by the elaboration of new theories. To briefly set forth what has been learned, so as to form a basis for observation and research, is all that will be attempted.

Until recently, botanists have recognized only *Astragalus mollissimus* and *Oxytropis Lamberti* as loco weeds; but now *Astragalus Mortoni*, *Crotalaria sagittalis*, *Hosackia Purshiana*, *Sophora sericea*, *Oxytropis deflexa*, *O. multiflorus*, *Malvastrum coccineum* and *Corydalis aurea* var. *occidentalis*, are all under the ban. F. W. Anderson, in an article in the Botanical Gazette for July, 1889, adds *Leucocrinum montanum*, *Fritillaria pudica* and *Zygadenus elegans*. The first is common around Denver in the early spring, and is generally considered harmless to stock beyond tainting the milk of the cows that feed upon it before the grass comes.

Professor L. E. Sayre of the Department of Pharmacy of the Kansas State University, made a chemical examination of the leaves of a loco plant, which he failed to name, and his report was published in the Druggists' Bulletin, May, 1889. The results were unsatisfactory, some slight evidences of a toxic alkaloid being discovered.

Dr. Isaac Ott, in the American Journal of Pharmacy, tells of his experiments on frogs and other lower animals with an alkaloid which he obtained from *Astragalus mollissimus*. He formulates its action as follows: "1. It decreases the irritability of the motor nerves. 2. It greatly affects the sensatory ganglia of the central nervous system, preventing them from receiving impressions. 3. It has a spinal tetanic action. 4. It kills mainly by arrest of the heart. 5. It increases the salivary secretion. 6. It has a stupefying action on the brain. 7. It reduces the cardiac force and frequency. 8. It temporarily increases arterial tension and finally decreases it. 9. It greatly dilates the pupil of the eye." Professor Sayre tried the effect of a concentrated solution of this drug upon himself, commencing with a small amount but increasing to a dose of an ounce every three hours. He perceived no effects except a slight stimulation of the stomach and circulation. During the summer of 1887 and 1888 he traveled through Indian Territory, Kansas, Colorado and New Mexico, inspecting the herds, but did not find a single animal having the symptoms commonly ascribed to the locoed. Professor Sayre is strongly of the opinion that the effects attributed to loco must come from some other cause.

Dr. Mary Gage Day, in an article in the New York Medical Journal, describing a series of experiments carried on for a year and a half, arrives at a different conclusion. She made a decoction of roots, stems and leaves, and daily gave sixty or seventy cubic centimeters to a half-grown vigorous kitten while plenty of milk and other food was also supplied. She thus describes the results: "The kitten became less active, the coat grew rough, appetite for ordinary food diminished and fondness for the loco increased, diarrhœa came on and retching and vomiting occasionally occurred. The expression became peculiar and characteristic. Emaciation and the above symptoms progressively increased until the eighteenth day, when periods of convulsive excitement supervened. At times the convulsions were tetanic in character; frothing at the mouth and throwing the head backwards as in opisthotonos were marked. At other times the kitten would stand on its hind legs and strike the air with its fore paws, then fall backward and throw itself from side to side. These periods of excitement were followed by perfect quiet, the only apparent sign of life being the respiratory movements. After a short interval of quiet the convulsive movements

would recur. These alternate periods of excitement and quiet lasted thirty-six hours, when the posterior extremities became paralyzed and the kitten died about two hours afterwards. There was no apparent loss of consciousness before death. The post-mortem examination revealed the presence of ulcers in the stomach and duodenum. The heart was in diastole; brain and myelon appeared normal. As might be expected from the emaciation the entire body was anæmic."

She tried the same experiment on a vigorous full-grown cat with the same results. Two strong young cats were confined and treated exactly the same, except that one was given a decoction of loco daily. The latter became diseased while the other remained healthy. The cats acquired a decided liking for the new drink and would beg for it as for milk. To discover its effects upon an herbivorous animal she tried feeding fresh loco to a young jackrabbit that had been captured. After refusing the weed for a short time it began to relish it and eat it as eagerly as grass. In about ten days the rabbit was found dead with its head thrown back and stomach ruptured. She thinks that the plant is more poisonous in the fall and winter, after the seeds have ripened. The plants used in her experiments were *Astragalus mollissimus* and *Oxytropis Lamberti*. These are her final conclusions: "I. That there is some poison in loco weed which may cause the illness, and, if sufficient quantity is taken, the death of an animal. II. This poison is contained in the decoction obtained from the plants, and by systematically feeding it to healthy cats cases of loco disease may be produced. III. Taste for the green loco weed may be experimentally produced in the jackrabbit (an animal indigenous to Kansas). IV. From the large quantity of the plant or decoction required to produce the disease, the poison must be weak, or, if strong, it must be in a very small amount."

Dr. Day's conclusions are certainly the more convincing, for her experiments were kept up for some time; while in the other cases but few doses were given. Her methods, too, were more in accordance with the manner in which an animal on the range would become poisoned.

In 1882, 1883 and 1884 a fatal disease prevailed among the horses along the Missouri valley in Iowa, Nebraska and Dakota. Dr. M. Stalker, State Veterinarian of Iowa, discovered it to be due to *Crotalaria sagittalis*. The symptoms were similar to those produced

by the loco weeds, and upon looking for some plant allied to Astragalus or Oxytropis, he found the Crotalaria in great abundance. He had a large quantity of the green plant collected and tried to feed it to a young horse. The animal refused it, and finally he introduced a strong decoction into the stomach by means of a stomach pump. The horse exhibited all the symptoms of the poisoned animals, but recovered after a few hours. The next day he was given half as much as on the first day, and the animal died in an hour and a half. He procured another horse and gave it daily the infusion from a quart of the pods. The animal, after showing the characteristic symptoms, died on the thirteenth day.

Dr. F. B. Power and J. Cambier of the University of Wisconsin, made various chemical tests upon the Crotalaria and concluded that it contained a toxic alkaloid in small amounts. The Crotalaria caused great losses, amounting to thousands of dollars' worth of stock on some farms. The disease was marked by the emaciation so characteristic of the loco poisoning. Some animals became violently crazy, breaking through fences; but others exhibited stupor or coma, falling asleep while eating, and sometimes standing for a week sleeping most of the time with the head against some abject.

Of course, the subject of loco is more generally discussed in those states where stock-raising is one of the chief pursuits. Great losses have occurred in Colorado, particularly in the southern part. Mr. Ed. Farr, a prominent cattleman of Walsenburg, Huerfano county, Col., claims that, on an average, three hundred head of cattle are killed from loco in that county every year. Mr. E. C. Van Diest of San Luis, Costillo county, Col., writes as follows: "Fully twenty-five per cent. of the losses on cattle and horses in this section are due to loco weed. Its poisonous qualities seem to have the greatest effect from November to May. It is tempting to stock in the winter, when the grass is more or less covered with snow and its leaves surmount the snow; and also in the spring, when the grass is beginning to sprout and it is already of considerable size and conspicuous from its fresh verdure. The poison of the weed affects the nervous system, first clouding the brain and then paralyzing to a certain extent all muscular action until the animal finally dies in a state of stupor and seemingly of starvation. It begins by walking in a circle, which gradually narrows until the animal falls and expires. Though no well-fed animal will touch it, one that has happened

to eat the weed once or twice prefers it to grass, can no longer be fattened and becomes stupid and insensible to blows. Some victims indicate the spread of the disease by a sort of trembling, others become unmanageable and really crazy. The weed has no effect whatever on hogs; on sheep its effects are slight; horses seem most readily poisoned and cattle next."

The losses attributed to loco poisoning were so serious in Colorado that the legislature of 1881 passed a law to this effect: A premium of one and a half cents per pound was to be paid out of the state treasury on all loco or poison weed dug during the months of May, June and July. Each weed must be dug up not less than three inches below the surface of the ground and was to be thoroughly dry when weighed. The person who dug the weed was to produce it before the clerk of the county where it was obtained and swear that it was loco. The clerk was then to weigh the weed, burn it and give the owner a certificate setting forth in words the number of pounds of the weed, the name of the person, and that he had proved the digging up of the weed and was entitled to the premium. Upon presentation of this certificate to the county treasurer he was to be paid from the state treasury or he might pay his taxes in loco.

Considering the great number of species of Astragalus which abound in that region, so closely resembling each other that trained botanists find it difficult to surely and readily identify them, the impossibility of the ordinary county clerk accomplishing this task will be comprehended. He certainly could not examine every weed to see that the root was of the required length nor could he always be positive that every plant in the tons that were brought to him was the true loco or poison weed. How could he know when the plant was dry that it had been dug up only during the indicated months? Loco lands soon became very profitable, since a ton of loco was worth thirty dollars while the best upland hay brought only half that amount. Judging from the reports of expenditure on premiums, the supposed loco must have been brought in by the wagon load. The Mexicans were accused of planting it and caring for it assiduously. It would not be necessary to plant it, since if the roots were left in the ground, a new crop would at once begin to flourish; for loco is like alfalfa and comes up afresh whenever it is mown. Either in spite of the law or because of it the loco steadily increased

and soon threatened to bankrupt the state. Mr. Henry W. Selover of Denver, who carefully collected the facts concerning the law and its effects, gives the following table to show the result upon the revenue of the state:

COUNTIES.	Gener'l Revenue from 1881 to '84, inclusive.	Loco Certificates issued '81 to '84, inclusive.	Amount short.
Chaffee	$24,632 73	$1,892 63	....
Conejos	18,342 65	18 55	....
Costillo	11,540 35	28,403 69	$16,863 34
Custer	16,758 98	21,017 44	4,258 46
Elbert	23,768 94	15 00	....
El Paso	71,086 66	17,671 02	....
Fremont	30,741 96	1,588 68	....
Huerfano	16,946 08	41,748 89	24,802 81
Las Animas	41,344 37	14,063 12	....
Park	24,989 92	1,595 42	....
Pueblo	81,142 09	4,399 24	....
Saguache	18,221 84	21,142 28	2,920 44
Total	$379,516 57	$153,555 96	

The law was luckily repealed in 1885, before it had swallowed the entire state revenue. The history of this legislation is a most notable instance of the inefficiency of bounty laws. The destruction of pests can and ought to be left to those most directly concerned. Indeed, to foster rather than destroy seems the general tendency of all bounty laws.

It seems strange, with agricultural experiment stations throughout the country, that the loco question does not become settled. Much of the confusion doubtless arises from the great similarity existing among the species of Astragalus and Oxytropis. The poison, too, may not be inherent in the plant, but due to a fungus or an insect. This view would perhaps explain its prevalence during some years and in certain regions and also the constantly increasing number of new loco weeds.

For much that this paper contains I am indebted to the Rocky Mountain Druggist, which republished the articles from which I have quoted.

SERENO WATSON.

Dr. Sereno Watson, after the death of Dr. Gray the foremost botanist of America, died at Cambridge, March 9, 1892, in the 66th year of age.

The many and important works which he has contributed to the knowledge of American Botany will form his best and most enduring monument.

RECENT LITERATURE.

Human Progress, Past and Future. By ALFRED RUSSEL WALLACE. Arena, January, 1892, pp. 145–159. An attempt is being made at the present day by the followers of Prof. Weismann to apply the Neo-Darwinian theories to all departments of scientific investigation. The natural impression has existed among many scientists that an acceptance of these views would lead to a very pessimistic outlook for man's future, but Mr. A. R. Wallace in the article under consideration takes the opposite stand. He points out the two significations of the term progress, which may mean either advance in material civilization, which he believes is cumulative and continuing at the present day, or advance in the mental and moral nature of man, which he thinks may be at a standstill. He contends, as many others have done, that the great works of antiquity have not been surpassed at the present day. Thus he says: "The earliest known architectural work, the great pyramid of Egypt, in the mathematical accuracy of its form and dimensions, in its precise orientation, and in the perfect workmanship shown by its internal structure, indicates an amount of astronomical, mathematical and mechanical knowledge, and an amount of experience and practical skill, which could only have been attained at that early period of man's history by the exertion of mental ability in no way inferior to that of our best modern engineers. In purely intellectual achievements the Vedas of ancient India, the Iliad of Homer, the Book of Job and the writings of Plato, will rank with the noblest works of modern authors." More than this, Mr. Wallace thinks that the high-water mark of intellectual activity has sunk rather than risen

during the past two centuries, although the mean level may have risen. He seems to look upon human progress as advancing along one direct line, and from this point of view it might indeed seem that the high-water mark had not advanced. There is, however, another aspect of the subject. It is customary to represent the progress of life by the analogy of a tree; why not, then, look upon human progress as taking place in the same manner? According to this view the civilizations of Egypt, of India and of Greece represent the terminal buds of their respective shoots. Modern civilization started afresh from the trunk of the tree, and may indeed not yet have grown much above the tips of the old growth of Egypt or Greece; yet there can be no doubt that the new growth is a larger limb and has infinitely greater prospects of future progress.

Mr. Wallace then proceeds to consider the factors which have been operative in the past and those which may be expected to exert an influence on the future advance or deterioration of mankind. He shows how the warfare of tribe with tribe has destroyed the weaker, while the greater vital energy of higher races frequently causes the extinction of the lower. Still more powerful than this warfare of one tribe with another is the survival of the fittest among the individuals of a single tribe. "On the whole," says the writer, "we cannot doubt that the prudent, the sober, the healthy and the virtuous live longer lives than the reckless, the drunkards, the unhealthy and the vicious; and also that the former, on the average, leave more descendants than the latter." He asserts that this process of elimination will raise the mean level, but very properly adds that "it can have little or no tendency to develop higher types in each successive age; and this agrees with the undoubted fact that the great men who appeared at the dawn of history and at the culminating epochs of the various ancient civilizations were not, on the whole, inferior to those of our own age." (p. 149.) This is, however, a very remarkable passage for Mr. Wallace to pen, for he has here virtually given up his customary Neo-Darwinian stand. If the process of natural selection or elimination cannot develop higher types of man by the selection and accumulation of already existing variations, how indeed can natural selection produce higher types of animals, as Mr. Wallace claims, by the selection of fortuitous variations? But he forsakes this position in another place. How, indeed, can the passage just quoted be made to harmonize with the

following: "When this average rise has been brought about there must result a corresponding rise in the high-water mark of humanity; in other words, the great men of that era will be as much above those of the last two thousand years as the average man will have risen above the average of that period. For those fortunate combinations of germs which, on the theory we are discussing, have brought into existence the great men of our day, will have a far higher average of material to work with, and we may reasonably expect the most distinguished among the poets and philosophers of the future will decidedly surpass the Homers and Shakespeares, the Newtons, the Gœthes and the Humboldts of our age." (p. 158.)

In no possible way can these two passages be reconciled. He first asserts that natural selection has raised the mean level of humanity but cannot raise the high-water mark, and follows this by another passage in which he says that the elevation of the mean level will furnish a higher class of material for germ-combinations to work upon in the origination of a higher type of genius.

Mr. Wallace briefly discusses the theory of the isolation of the germ-plasm, which carries with it the non-inheritance of acquired characters. Education, according to this view, cannot have any direct effect upon human progress. The writer argues that if educational influences could be transmitted it would be reasonable to expect that there would be a progressive improvement in the families of men of genius from generation to generation. He cites a considerable number of notable instances where this was not the case, however. Thus he says: * * * "we find that Dollond, the inventor of the achromatic telescope, was a working silk weaver, and a wholly self-taught optician; Faraday was the son of a blacksmith, and apprenticed to a bookbinder at the age of thirteen; Sir Christopher Wren, the son of a clergyman and educated at Oxford, was a a self-taught architect, yet he designed and executed St. Paul's Cathedral, which will certainly rank among the finest modern buildings of the world," etc. All of which may be perfectly true, but one is tempted to stop before completing the list and ask Mr. Wallace if he has forgotten the fact that all these men had mothers. Genius is a very unstable commodity and once the nice adjustment of mental traits by which it was brought about is disturbed by the introduction of a new element the whole organization is apt to be upset. Mr. Wallace might have continued with an enumeration of the sons of men of genius who have been worthless or insane.

The writer combats the view that the non-inheritance of educational culture is a bar to future progress. He goes even further and considers that it is a positive boon to humanity that such culture cannot be inherited. In order to do this he is obliged to take a most uncompromisingly pessimistic view of the present. "If it is thought," he says, "that this non-inheritance of the results of education and training is prejudicial to human progress, we must remember that, on the other hand, it also prevents the continuous degradation of humanity by the inheritance of those vicious practices and degrading habits which the deplorable conditions of our modern social system undoubtedly foster in the bulk of mankind. Throughout all trade and commerce lying and deceit abound to such an extent that it has come to be considered essential to success. No dealer ever tells the exact truth about the goods he advertises or offers for sale, and the grossly absurd misrepresentations of material and quality we everywhere meet with have, from their very commonness, ceased to shock us. Now, it is surely a great blessing if we can believe that this widespread system of fraud and falsehood does not produce any inherited deterioration in the next generation." There are many who would disagree with Mr. Wallace as to the universality of evil at the present day. Surely there is much less of evil now than in even comparatively recent past historical times. But even granting all that he requires of us, there must, according to his own views, be a time in the future when good will preponderate, at which time it will be as great a disadvantage that acquired virtue cannot be inherited as it now is an advantage that acquired vice cannot be. Yet another objection. According to the writer's views, the evil which he deplores in the present must be innate and due to the inherent properties of the germs, in which event it must be as easily transmitted, or indeed far more easily, than could an acquired character. This evil in man's nature which he sees may in fact be fostered by pernicious social institutions, but it must exist before it can be fostered, and if acquired characters cannot be inherited it must be inherent in the organism.

It may be of interest to inquire what Mr. Wallace considers to be the real factors of future progress. There are two such factors, he says. "The one is that process of elimination already referred to, by which vice, violence and recklessness so often bring about the early destruction of those addicted to them. The other, and by far

the more important for the future, is that mode of selection which will inevitably come into action through the ever-increasing freedom, joined with the higher education of woman." This second must indeed be a factor of great importance, it would seem, although by no means the only one. Selection of the best existing cannot alone produce anything better than the best. C. A. K.

The Auk for January, 1892, contains nothing of special interest to the Pacific Coast. The supplement containing the address by the president, Mr. D. G. Elliot, on The Inheritance of Acquired Characters, is a timely and interesting discussion of this vital problem in biology, and deserves a careful reading. The closing words of the address are especially worthy of consideration by our American ornithologists. "The subject I have discussed offers a new field for ornithologists to explore: one of a higher plane, and permitting a wider vision than many of those they are accustomed to tread. I submit it to my younger colleagues, who have time and opportunities before them, as of infinitely more importance than the discovery and naming of new forms, which is by no means the beginning and end of ornithology, but rather, if I may so term it, the A B C of the science; and then, by their contributions towards the elucidation of my theme, they will benefit not only those who are devoted to our own branch, but also scientific men throughout the world." His arguments would have had more weight if they had not been stated from so obviously a partisan standpoint. Some of the instances which he gives in proof of the inheritance of acquired characters may be equally well explained in other ways, and hence are not conclusive. C. A. K.

A Preliminary Study of the Grackles of the Subgenus Quiscalus. By FRANK M. CHAPMAN. Bull. Am. Mus. Nat. Hist., iv, 1–20. The subgenus Quiscalus has always been known as a puzzling group of birds, but the real complexity of the inter-relationship of the different forms was probably not fully realized before the appearance of Mr. Chapman's comprehensive review. Although 845 specimens were examined, this material was found insufficient to complete the study of the group. Certain questions of vital importance are, however, apparently settled. The three forms, *Quiscalus æneus*, *Q. quiscula*, and *Q. quiscula aglæus*, are carefully described, and in a summary a brief diagnosis of each form is given, including

each of the three phases of *quiscula*. The variations of each form are then carefully followed throughout their breeding range, and the general conclusions as to relationship stated. The two most important conclusions are that—" In the Alleghanies of Pennsylvania, in the Hudson Valley from Sing Sing to Troy, in eastern Long Island, in Connecticut, and in Massachusetts as far north as Cambridge, *quiscula* and *æneus* completely intergrade"; and that—" This intergradation is in every instance accomplished through phase No. 3 of *quiscula*."

Mr. Chapman then argues very reasonably that *quiscula* is a distinct species, and not a race of *æneus*. If this be not the case, he asks why *æneus* should remain so perfectly constant over an immense area and then change into three different forms. It is, at least, impossible to see any environmental influence which could have produced such a modification as this, and the matter accordingly becomes inexplicable upon any theory except hybridity.

Although Mr. Chapman has established by his careful investigation at least the great probability that hybridization is the rule among the grackles, he is hardly justified in extending this to other species. Thus he says: " Nor do I see any good reason why we should refuse to admit hybridization as a factor in the evolution of what we term species. * * * Difference in habit under what must necessarily be similar conditions will ever be an effectual barrier against the indiscriminate mixing of even closely-allied birds. But when two species whose natural economy, song, nidification, etc., are the same, and which agree in structural details and differ only in coloration, inhabit contiguous regions, is it unnatural that they should at first occasionally, and in the end regularly, interbreed? The evidence in proof of such intergradation is gradually accumulating, and in the future I think we shall be forced to recognize hybridization, not only as a means which unites known forms, but which also gives rise to new ones."

The writer has apparently overlooked, in the above passage, the possibility of physiological selection interposing a barrier to hybridization, even when the two species appear to be structurally identical. If the theory of physiological selection is to have any validity whatsoever, it is necessary to assume that such cases of habitual hybridization as are occasionally recorded, are exceptional and abnormal. To be sure, it may be objected that this is arguing from

theory to fact, but then a good and useful theory should not be too lightly discarded. C. A. K.

The North American Species of the Genus Colaptes, considered with Special Reference to the Relationships of C. auratus and C. cafer. By J. A. ALLEN. Bull. Am. Mus. Nat. Hist., iv, 21-44. In the present paper Mr. Allen has undertaken a most careful and thorough investigation of the remarkable intergradation existing between *Colaptes auratus* and *C. cafer.* His report is based upon the examination of 785 specimens of the genus from North America and the West Indies, representing all the known species and varieties inhabiting this region. The relationship of the two species under consideration is first discussed, and the characteristics and distribution of the various races given. More detailed attention is then devoted to the intermediate birds, the conclusions arrived at with regard to them being stated as follows: "The facts elicited in the present investigation tend strongly to confirm Baird's startling hypothesis of hybridization on a grand scale between *Colaptes auratus* and *C. cafer*, to account for the occurrence of birds presenting ever-varying combinations of the characters of the two species over the Plateau and Great Basin regions of the continent. None of the other hypotheses thus far advanced so fully, or, in fact, to any great extent, meet with the requirements of the case. In no instance do we meet with stages or methods of geographical variation at all comparable with what is seen in the case of *C. auratus* and *C. cafer.* The transition between geographic forms, however diverse, is gradual and symmetrical, affecting all parts of the plumage equally and simultaneously, and is obviously correlated with changes in the physical surroundings; also, the differences between the most extreme forms are merely differences of degree. In the case of Colaptes, the essential differences between *auratus* and *cafer* are radical; they are, in fact, contrasting characters, and the intergradation is irregular, with all sorts of a symmetrical combinations of the characters of the two forms, and no correlation between their intergradation and the conditions of environment."

Mr. Allen has, in fact, practically demonstrated the habitual hybridization of these two species, as Mr. Chapman has just succeeded in doing for the grackles. The bearing of this demonstration upon the infertility of crosses and the relation of color to sterility, as discussed by Wallace in "Darwinism," is very important, placing the

subject in a somewhat new light. The facts do not seem to bear out Mr. Chapman's suggestion, however, that hybridization may be a means of originating new species, for, in the present instance, the tendency seems to be rather to merge two existing species into one. C. A. K.

The Geographic Distribution of Life in North America, with special reference to the Mammalia. By C. HART MERRIAM, M. D. Proc. Biol. Soc. Washington, vol. VII, pp. 1–64. Fauna No. 3 of the Department of Agriculture was an epoch-making work in the literature of the geographical distribution of animals in America. Dr. Merriam, in the present work, has amplified and systematised the ideas which were there first enunciated. With the unequalled facilities at his command in the shape of probably the largest and most discriminatingly collected series of mammals that has ever been made from the same extent of territory, he is in a better position than any of his predecessors to draw conclusions with regard to the distribution of life in North America.

The paper commences with a historical synopsis of the faunal and floral divisions proposed for North America by various writers. Each division is considered separately, with a chronological table of the work of different writers upon it. The different life regions are then discussed with reference to the mammals inhabiting each. Considerable space is devoted to the causes controlling distribution and in combating certain of Wallace's views. Dr. Merriam is especially pronounced in asserting the importance of temperature in directly affecting the distribution of animals, and his answer to Wallace with regard to the change in mammalian forms from the north southward is very forcibly put. The general drift of his paper is, that life zones are largely climatic, and consequently extend in belts more or less parallel to the equator rather than in a north and south direction, as claimed by Wallace.

In closing, he says: "Wallace, in writing of the principles on which zoological regions should be formed, expresses the opinion that 'convenience, intelligibility and custom should largely guide us.' But I quite agree with America's most distinguished and philosophic writer on distribution, Dr. J. A. Allen, that in marking off the life regions and subregions of the earth, truth should not be sacrificed to convenience; and I see no reason why a homogeneous circumpolar fauna of great geographic extent should be split up into primary re-

gions possessing comparatively few peculiar types, simply because a water separation happens to exist in the present geologic period; nor is it evident why one of the resulting feeble divisions should be granted higher rank than a region of much less geographic extent comprising several times as many types." C. A. K.

Wood Notes Wild. Notations of Bird Music, by SIMEON PEASE CHENEY. Collected and arranged with appendix, notes, bibliography, and general index, by JOHN VANCE CHENEY. It has been the fashion of scientific ornithologists to pass over the songs of birds as something unworthy of their serious attention, contenting themselves with occasional vague phrases descriptive of bird notes introduced in their lighter writings. The cause of this is not that bird songs are of no scientific importance, but that it is almost impossible to record them in a manner sufficiently accurate to reduce their study to a science. There is no reason why the phonograph might not be brought into use for this purpose; but in the absence of any such investigations as this, the work of Mr. Cheney cannot fail to prove a great benefit to this much neglected corner of science. It remains for future investigators to verify the accuracy of his musical notations; but in view of the fact that he was primarily a musician, and at the same time an accurate and painstaking observer and an enthusiastic admirer of birds, there is every probability that his interpretations are in the main correct.

As a foundation for the future study of bird notes, the value of this work cannot be overestimated. The typical songs and many of the variations and call notes of all the more common Eastern birds are recorded in musical scale with text descriptions and amplifications.

Much of this music has been published in the magazines, but Mr. John Vance Cheney has done more than make a collection of his father's work in the present work. Over half the book is devoted to an appendix, in which are incorporated all the most important descriptions and notations of bird music which have been published by other writers, with much other matter bearing more or less directly on the question under consideration. A very full bibliography of the subject closes the work. C. A. K.

The American Naturalist. October, 1891.—Notes on the Hearts of Certain Mammals: By Ida H. Hyde. Brief notes on points of

interest regarding the hearts of sheep, cat, man, monkey, panther, raccoon, hyena, dog, deer, calf, horse, donkey and rabbit.

November, 1891.—Language and Max Müller: S. V. Clevenger, M. D. A criticism of Müller's attitude with regard to the evolution of language. The writer says: "Throughout Max Müller's writings he is handicapped by his exaggeration of the importance of his particular line of research, carried on as an isolated study. Could he but have a fair knowledge of associated sciences, such as that of anthropology, anatomy, physiology and zoology, the value of his work would be greatly increased, and his inferences would undergo radical changes." On the Quantity and Dynamics of Animal Tissues: J. Lawton Williams. Recent Progress in the Discovery of the Phylogeny of Man: Editorial. The discovery of skulls verifying the supposition that a race of people inhabited Europe with skulls similar to that of the Neanderthal man, is noted. Also, of two nearly complete skeletons, of which they say: "Taking it altogether, the Canstatter race answers the expectations founded on theory as to what an ancestral type of man ought to be." Professor Cope also finds confirmation for his theory that the anthropoid apes and man were descended from the anthropoid lemur Anaptomorphus, without passing the intervention of the old world monkeys. C. A. K.

The Ibis, for January, 1892, contains among articles of general ornithological interest, a list of the birds of Heligoland as recorded by Herr Gätke, by Henry Seebohm; Some further Notes on the Periods occupied by Birds in the Incubation of their Eggs, by William Evans, F. R. S. E.; and the fourth part of the Rev. James Sibree, Jr.'s, paper, On the Birds of Madagascar and their Connection with Native Folk-lore, Proverbs and Superstitions. C. A. K.

HARALD SCHÖTT, of the University of Upsala, Sweden, has published: *Beiträge zur Kenntniss Kalifornischer Collembola*, mit 4 tafeln in Bihang Till K. Svenska Vet.-Akad. Handl. Bd. 17, Afd. iv, No. 8.

Collembola are minute Thysanuræ, or wingless insects, which live under leaves and stones, and propel themselves by jumping. The work is a very interesting one, as very little is known about these small animals in any part of the world. The material was collected in California by Dr. Gustav Eisen, and forwarded to the author for

description. The following species are described, five of which are new: *Sminthurus Eisenii*, n. sp.; *S. luteus Lubbock; S. niger Lubbock; S. plicatus*, n. sp.; *Papirius maculosus*, n. sp.; *Tomocerus* sp.; *Entomobrya nivalis* L.; *E. multifasciata* Tullb.; *E. marginata* Tullb.; *Sira purpurea*, n. sp.; *Drepanura californica*, n. sp.; *Orchesella rufescens* Lubbock; *Isotoma viridis* Bourl; *I. palustris* Müller; *Achorutes armatus* (Nicolet); *A. viaticus* Tullb.; *Xenylla maritima* Tullb.; *Lipura inermis* Tullb.; or, in all, about 18 species. The paper is handsomely illustrated. G. E.

Revisio generum plantarum vascularium omnium, atque cellularium, multarum, secundum leges nomenclaturæ internationales, cum enumeratione plantarum in itinere mundi collectarum. Mit Erlauterungen von DR. OTTO KUNTZE.

This book is likely to serve a most useful purpose—it shows to what extent zeal without discretion may carry a reformer, and incidentally may make clear to a few American botanists, ardent makers of synonyms, their inability to cope in such matters with those who are able at any time to consult the great libraries of Europe.

Dr. Kuntze, in his journey round the world, collected a few thousand species, and in working them out to his satisfaction, changes about thirty thousand names. The means by which he arrives at this result is the rather radical one of taking for his point of departure an earlier work of Linnæus than the one generally adopted.

Another method of changing genera which he uses with considerable effect is the substitution of older sectional, for more recent generic names. This though the logical outcome of the practice of some American botanists in the matter of varietal names is as repugnant to common sense as a claim of priority founded on the distribution of named sets.

The license, which the author allows himself, of modifying (correcting as he terms it) generic names, is not likely to meet with acceptance. The principle of priority will appear to most persons to be as absolutely overthrown by substituting Cumaruna, Catutsjeron, etc., for Coumarouna, Katoutsjeroe, etc., as by making entirely new names. The principle is the same, the violation differs only in degree, and the inconvenience resulting from the alterations in indexing is the same.

A considerable number of his generic changes will probably be concurred in, though not in the scrambling manner in which they

are launched by the author; but his wholesale transference of the species of a thousand genera, many of them of great extent, can only be considered an instance of colossal vanity, which will go far to convince botanists of the value of the zoological rule. It is impossible to assign any other reason than the gratification of personal vanity to the author's addition of "OK." to all the species of such genera as Astragalus, Selaginella, Lepiota, Corticium, etc., the value of which species he could not possibly know. It is an amusing circumstance that in America the abbreviation with which his pages is so plentifully besprinkled is a slang expression in common use, said to have had its origin in indorsements on papers submitted to an eminent politician, who was as lawless in orthography as our author has proved himself in botany. When questioned as to its meaning, he explained that it meant "Oll Korect."

It is to be hoped that in giving new names to his genera he did not act from a malicious desire to render the recipients of his favor ridiculous. Such names as "Bakeropteris," "Bisbœckelera," "Biscogniauxia," "Brittonamra," "Cookeina." "Durandeeldea," "Greeneina," "Henribaillonia," "Jacksonago," "Jamesbrittenia," "Peckifungus," "Radlkoferotoma," "Sirhookera," "Sirmuellera," "Smithiantha," may look well to his eyes and sound agreeably in his ears, but his taste is likely to be unique.

Among the numerous changes which, if adopted, would affect our Californian plants, may be mentioned Buda, which the author adopts instead of Tissa, because the latter remained longer a "nomen nudum;" but with a degree of inconsistency for which one would have hardly looked, he shortly after adopts Meadia instead of Dodecatheon, transferring all the "species" (of whose value he is necessarily absolutely ignorant) to a genus which remained "naked" till his day—that he might attach "OK." to the species.

Agoseris, which he accepts in place of Troximon, is in similar case according to Mr. Greene the devoted disciple of Rafinesque, for all the species are claimed by Mr. Greene in "Pittonia," which of course he could not do if there were a type species. Dr. Kuntze nevertheless, having apparently kept the scope and intention of his work entirely secret, renames the species under the same date as Mr. Greene, but of course attaches "OK." to all of them. A similar muddle results from the equally inexcusable renaming of Leguminous species by Dr. Taubert in Bot. Centralblatt, September, 1881.

We have therefore in these cases and probably many others, two sets of synonyms, the priority of which will be extremely difficult to prove should it ever be necessary to do so.

Navarretia, which has priority over Gilia, has also the refreshing novelty of a type species; for the number of genera in which all the species are credited to "OK." becomes monotonous. As to the changes involved by calling Lepidium, Nasturtium; Ionidium, Calceolaria; Gouania, Lupulus; Phlox, Armeria; Cortinarius, Gomphus; etc., we fear the author's life will not be long enough to see them made.

The changes in nomenclature are not confined to phanerogamic botany, but cover the whole range of the vegetable kingdom, and wholesale changes are made quite as coolly in fungi, the genera of which are notoriously in a transition state, as in the more settled orders. It is to be feared that Cryptogamic botanists will consider the author guilty not only of folly but of impertinence as well.

As the author has done little in studying the values of genera, the changes in specific names are comparatively few. He shows a tendency to reduce genera, and though there is a sufficient field for the exercise of such a spirit, it may be doubted whether he has selected the most promising examples.

He argues at length and with considerable feeling against the changing of specific names, and most botanists will agree with him; but he might have gone much further and shown how improper and unnecessary it is to change them at all, except in monographs of families—else why the third name attached to species? In the work of botanists who accept the zoological rule, and they are numerous and increasing, the cited name furnishes a means of distinguishing the species until the monographer can deal with them. Mr. Hemsley, for instance, in listing the Mexican species of Dalea,* evidently recognizing the fact that he was unable to judge of the validity of the species with the material at hand enumerates—

20. *Dalea elata* Hook. & Arn.

21. *Dalea elata* Mart. & Gal.,

and the future monographer of the Leguminosæ will be able to distinguish them and decide on their merits just as well as if one of them had been afflicted with the name *galeottiamra*.

* Biol. Cent.-Am. i, 239.

The sooner any botanist of our day divests himself of the idea that he is likely to live to see a settled nomenclature, or that the rest of the botanical world will allow some fifth-rate authority to attach his name to the work of all the great men who have preceded him, the sooner we shall be able to argue out generic questions without lugging all the species in by the ears, and so adding immensely to our synonymy.

The reason for such extensive changes without study of the species, can only be the belief of an author that his judgment will finally settle the nomenclature, and the fact that these wholesale transferences are made almost entirely by those who attach the last combiner's name furnishes the strongest proof of the motive. Whatever fault may be found with Bentham and Hooker for their work in "Genera Plantarum" they must be commended for their modesty, for on the line followed out by Dr. Kuntze they might have attached B. & H. to an immense number of species, with no greater trouble than that involved in the employment of an additional copyist.

It should not be forgotten by botanists in haste to settle nomenclature, that there are two questions hanging over systematic biology of such importance as to cast Dr. Kuntze's modest contribution to synonymy entirely into shade. The first of these is homonymy as between zoology and botany, a question which can only be settled by agreement between the great body of zoologists and botanists. The second, the limits of genera, we may all help to solve. About species there is often a considerable divergence of honest opinion, which time and better knowledge will be apt to reconcile, but genera should be more easily settled. It ought to be possible to make to some extent rules as to what should and what should not be taken into consideration, especially as long as genera are to a great extent matters of convenience. Undoubtedly the tendency is to make them more strictly natural, and great modifications are likely to result particularly in such families as Compositæ, Caryophyllaceæ, Acanthaceæ, etc., in which they are now extremely artificial. A little logic injected into systematic botany might enable us, for instance, to see that if its various sections can be properly included in the genus Quercus, there can be no sufficient reason for holding Castanopsis distinct from Castanea or Carya from Juglans. The theory that the limits of genera and

species can best be determined by a kind of individual "insight" without any rule whatever, has had a long trial and the heterogeneous results are hardly encouraging. [K. B.

Monograph of the Grasses of the United States and British America. By DR. GEORGE VASEY, Botanist, Department of Agriculture. Pamphlet, 8vo pp. vi, 89, xiv.—This is No. 1, of vol. iii, of the "Contributions from the U. S. National Herbarium," and is "published by the authority of the Secretary of Agriculture." This part closes with the family Agrostideæ.

The author states that for several years he has had in contemplation the work here presented. Every one knows of the great wealth of material—necessary for the preparation of such a work—contained in the National Herbarium. Collections of grasses from all parts of North America have been coming to this herbarium for a long time past, and these additions have been especially frequent in recent years. Liberally supplied with books and assistants, and otherwise very generously supported by our National Government, the Botanist of the Department has had unrivalled facilities for the production of the present "Monograph."

The work before us comes far from meeting our expectations. It is entirely lacking in that clear, precise and systematic presentation of facts which stamp the work of the true scientist; and instead of being a "Monograph," it is very largely a compilation—a bringing together of scattered descriptions, some of which are quoted and duly credited, some quoted "with a little alteration" (mangled, would better express it), and some quoted without any recognition of the source whatever; and these last form no inconsiderable portion of the whole. This frequent quotation of descriptions published by various authors renders the whole thing incongruous, not only in the relative length and character of the descriptions given, but in the terminology. If the original descriptions of the species had been copied instead of those published by later authors, and a proper system of references adopted, the value of the work would have been increased.

Setaria viridis and *S. glauca*, on p. 38 of the "Monograph," do not appear to possess very marked distinguishing characters.

Stipa Stillmani, on p. 51, is rendered as follows: "*S. Stillmani* Bolander. (Bot. Cal. ii. p. 287)." Then follows Dr. Thurber's description of this species, word for word, excepting that the floret is

said to possess a "white, hairy callus," instead of a "white-hairy callus," as Thurber wrote it, and there is nothing to indicate that it is not all original. One would naturally infer from the above, however, that Bolander published this grass in the Botany of California, which was in fact not the case.

The description of *Stipa leucotricha*, on p. 53, is but a translation of that given by Trinius and Ruprecht in their joint work usually cited "Stipaceæ," not "Gram. Agrost.," as appears in the work before us.

On p. 55 *Stipa Richardsonii* Link is described and there is given the reference in parenthesis, "(Gray's Manual, 6th ed., p. 641)." This amounts to a statement by the author that he is describing the same plant as that described by Gray in the 6th ed. of the Manual, but he states below that his description applies to the "large form which Prof. Macoun called var. *major*, and is perhaps specifically distinct from the form which is found on Lake Superior" (where on the lake is not specified) "and eastward." We all know that it is this eastern form which is "perhaps specifically distinct" from the other, that is described in the Manual.

Did Smith describe *Polypogon littoralis* in the Botany of California? We might very justly presume so from the way the name and description stand on p. 57. And why is it that quotation marks enclose the descriptions of *Polypogon Monspeliensis* and *P. littoralis*, and not that of *P. maritimus?* Is it because there were no specimens of these plants in the National Herbarium that the monographic character of the work was thus marred by scissors and paste? The descriptions of *Sporobolus compressus* and *S. serotinus* are taken entire from Gray's Manual, and one might be led into the error that the last named species was first described by Gray in the 6th edition of the Manual.

On p. 80, there seems to be some confusion as to *Calamagrostis dubia*. It is described as a species, and also presented as a var. of *C. Canadensis*.

There is nothing in the descriptions indicating the differential characters of allied species, and rarely are there any comparisons drawn. Carefully describing one organ or a part in one species and saying nothing about this in the next in sequence is far too common a feature in existing descriptions of our plants, and leads the student into a world of tribulation. A close attention to this point

in the preparation of monographs would, we think, somewhat reduce the number of our species, especially in Gramineæ. In this connection we might call to notice the descriptions of *Alopecurus Howellii* and *Alopecurus Macounii*, in the present work (pp. 87 and 88).

The assistance afforded by the translation of "The True Grasses" in the preparation of the analytical tables is acknowledged in the Introduction, and thanks are returned to Prof. Hackel for the privilege of using this work, although the translation is an American production and copyrighted by the publishers.

There are a number of "slips" which might trouble or confuse the student. We are told on the first page that the floral organs, the palet, the lodicules and the floral glume, "constitute a spikelet." Only the first glume in the Andropogoneæ is said to be "more indurated than the inner ones." Over Oryza, on p. 4, the empty glumes are described as "awnless, the flowering glume and palet much compressed laterally." These characters are supposed to enable us to distinguish Oryza from Leersia, which follows, and which has "flowering glumes awnless;" we are not told whether the glumes are compressed or not. In the tribe Oryzeæ, the empty glumes are said to be "two or none, very seldom numerous." Hackel says "empty glume two or more, very seldom numerous." In most of our species of this tribe the empty glumes are wanting. The grain in Sporobolus (p. 5) is characterized as "loosely enclosed or naked." On the same page the flowers of Epicampes are said to be "large" and "not awned."

In this first part some twenty species are described for the first time, and a few of these are characterized as new.

We hope that greater care will be exercised in the preparation of the second part, which the author hopes to publish "within a few months." In the Introduction, criticisms are invited, and we only regret that a work so excellent in its object should be so open to criticism. If through what has here been said, the character of part 2 reaches a higher plane, we shall only be too glad to publish the fact. F. LAMSON SCRIBNER.

Fossil Botany: Being an Introduction to Palæophytology from the Standpoint of the Botanist. By H. GRAF ZU SOLMS-LAUBACH, Professor of Botany in the University of Strasburg. *Authorized English Translation.* By HENRY E. F. GARNSEY, M. A. Among re-

cent botanical works it would be hard to find one which is more welcome to the student than the one before us. The original was published in Germany, in 1887; and now we have an admirable English translation issuing from the Clarendon press, to which we owe so many excellent translations of standard German botanical works.

The literature of palæophytology is so scattered as to be practically inaccessible to the general botanist; and, moreover, a great part of it is the work of men who are not botanists at all, the result of whose works is an appalling mass of fragmentary and often utterly unreliable material. Count Solms not only has won a high reputation as a palæophytologist but has also done excellent work in other departments of botany, and, as a thoroughly trained botanist, is eminently fitted for the task he has so admirably performed in the volume before us. To him we owe a careful resumé of what has been done up to the time of publication of his book, and a thorough sifting of the material thus brought together. He is extremely cautious in his judgments, and often suspends judgment entirely; but where he makes a positive statement one is sure that it is based upon adequate evidence. As the result of this careful examination, many forms, usually accepted by palæophytologists, are thrown aside as resting upon imperfect evidence, and, in consequence, one's ideas of the nature of many of the fossil forms are materially changed.

An introduction of some thirty pages deals largely with the conditions under which plant remains have been preserved in a fossil state, and includes an able discussion of the formation of peat and coal beds. The Thallophytes and Bryophytes are disposed of in a single chapter, and the rest of the book is devoted to a consideration of the lower vascular plants — Pteridophytes and Gymnosperms. The Coniferæ are treated first for reasons thus given by the author: "In departing from the customary arrangement * * * we have been influenced chiefly by practical considerations, for the adoption of this order will facilitate the discussion of the many doubtful forms which belong to one or the other of these classes, but which it will be best to consider in connection with similar groups of the Archegoniatæ." A chapter is devoted to the group, and the author seems to think that there is not sufficient evidence to warrant the assumption that conifers of the modern types existed

anterior to the Mesozoic. The remains occurring in older formations, and usually attributed to this class, are either too imperfect to permit of certain classification, or may better be referred to other groups. Of living genera Araucaria is certainly known as far back as the Jurassic, and Sequoia as the Cretaceous; Ginkgo is still older.

A special chapter is devoted to the Cycads and Medullosæ, and another to the remarkable entirely extinct group of the Cordaiteæ. To the latter, which are separated entirely from the Coniferæ, are referred many of the remains of fossil wood which have usually been supposed to belong to the Coniferæ. The most interesting point in connection with them is the discovery of flowers, both male and female, in a sufficiently perfect state of preservation to give a very fair idea of their structure, which differed materially from that of any living gymnosperms. The pollen grains are preserved with remarkable perfectness, even showing a group of cells within which is assumed to be a sort of rudimentary prothallium like that in the pollen of other gymnosperms, but much more highly developed. These points seem to warrant the separation of the Cordaiteæ as a class, co-ordinate with the Cycads and Conifers.

The chapter on the ferns is especially interesting and suggestive. While a considerable number of ferns have been found with well preserved fructification, all of these in the formations below the Mesozoic, that can be positively determined, show affinities with the Marattiaceæ and, perhaps, with the Ophioglosseæ. This fact is especially significant, as it entirely reverses the ordinarily accepted arrangement of the leptosporangiate and eusporangiate ferns. The former—*i. e.*, those ferns in which the sporangia are of strictly epidermal origin—are usually regarded as the simpler forms from which the Eusporangiatæ, or those forms with massive sporangia, like the Marattiaceæ and Ophioglosseæ, have been derived.

As the Leptosporangiatæ have firm sporangia that ought to have been preserved in a fossil state, it is difficult to account for their absence from the coal measures and earlier formations, if they really existed when these were forming. It seems probable that they are really later, more specialized forms, derived secondarily from the more primitive Eusporangiatæ. This view accords, too, with the evidences of embryology, and simplifies very much the problem of the origin of the phanerogams. The remains of hydropterides are very scanty, and only a few remains from the tertiary are beyond dispute.

Lack of space forbids our dwelling upon the very full account of the characteristic groups of the Calamarieæ, Lepidodendroideæ, Sigillarieæ and Sphenophylleæ. The first, which are usually supposed to show unquestionably near relationship to Equisetum, are shown to be much more imperfectly understood than was supposed, but for the details of the discussion the reader must be referred to the work in question. It is rather unfortunate that the angiosperms are not treated, as it would be extremely interesting to hear the author's views upon the origin of the group, as well as to have the data upon which to work for one's self.

The translation of the book and the typography are alike admirable, but it is a pity that it was not revised up to date, as several important works have appeared since the original was written. By a curious oversight this lack of revision was carried even to the title-page, where we are informed that the author is professor at Göttingen, although he succeeded De Bary at Strasburg more than three years ago. D. H. C.

Outlines of Lessons in Botany for the use of Teachers, and Mothers Studying with their Children. By JANE H. NEWELL. Part II. Flower and Fruit. The author of this little volume is an enthusiastic teacher, imbued with the spirit of modern science. The children are to study the plants themselves, so as to become original observers and thinkers instead of the "intellectual parasites" that so generally disgrace our schools. They are to be led to draw the parts of the flower, etc., united and separated, and in different sections. The correct botanical terms are to be learned as the necessity arises for their use. One of the most valuable features of the work consists of numerous suggestions for investigation into the habits of plants, particularly concerning the fertilization of flowers. Even quite little children may discover treasures of knowledge in this almost unexplored field. The study will become interesting and inspiring with such an incentive to patient, careful observation.

That the plants studied are chiefly those of New England, would make no difference to anyone but a rote teacher. It is the method illustrated by these studies that gives the book its great value as an aid to the teacher who is striving for the true education of pupils.

A. E.

The Identity of Asclepias stenophylla and Acerates auriculata. JOHN M. HOLZINGER. Bot. Gaz., Apr., 124. Mr. Holzinger having made careful study of the various forms of those plants, considers them mere variations of the same species, and unites them under the oldest available specific name, *Asclepias auriculata* (Engelm.). Studies of this kind are of much more importance than dozens of barely distinguishable "new species." K. B.

PROCEEDINGS OF SOCIETIES.

CALIFORNIA ACADEMY OF SCIENCES. *February 1, 1892.* President Harkness in the chair.

The Librarian reported 153 additions to the library.

Charles A. Keeler read a paper on "Heredity in its Relation to the Inheritance of Acquired Characters."

February 15, 1892. President Harkness in the chair.

Donations to the museum were reported from Charles A. Keeler, H. Abbott, Herbert Brown, E. D. Flint, Miss Louise A. Littleton, Geo. B. Badger, Charles N. Comstock, Charles Hubbard, T. B. Sanders, George W. Dunn, William G. Blunt, Walter E. Bryant.

The Librarian reported 160 additions to the library.

Dr. Gustav Eisen read a paper entitled: "The Evolution of the Forms of Trees as Produced by Climatic Influences."

March 7, 1892. President Harkness in the chair.

Donations to the museum were reported from W. S. Bliss, Gustav Eisen, T. B. Sanders.

Letters were read announcing the donation to the herbarium of a collection of Greenland plants by John H. Redfield, and of a package of specimens of Sphagna of the northeastern United States, by Edwin Faxon, and a vote of thanks was tendered to each of those gentlemen.

Charles A. Keeler read a paper entitled: "Is Natural Selection Creative?"

Dr. Harkness exhibited specimens of the Cynips which is now so abundant in Golden Gate Park, also of the galls from which they are emerging, and made some remarks on their life-history.

April 4, 1892. President Harkness in the chair.

The President announced the death of Sereno Watson, honorary member, and of William A. Aldrich, resident member.

The Librarian reported 222 additions to the library.

Dr. Harkness made some remarks concerning his observation on the life-history of the Cynips infesting the oaks, and discussed the probability of the one attacking the buds being an alternate generation of the one forming the woody galls.

F. Gutzkow spoke on certain improvements in his process for parting silver bullion, which he explained to the Academy about a year ago. He stated that it has now been introduced successfully into practice, for instance, at the large refining works of the Consolidated Kansas City Smelting Company. Among the novel modifications of the process the most important is the melting of the crystals of pure sulphate of silver, which are separated in the course of the process with five per cent. of charcoal in the crucible. They are thereby, at a very low temperature, converted into metallic silver, which melts and is poured into bars. Carbonic and sulphurous gases are generated and escape without giving any inconvenience:

$$Ag_2\,SO_4 + C = Ag_2 + CO_2 + SO_2$$

Charles A. Keeler made a few remarks bearing on the question: "What constitutes a species?"

April 18, 1892. President Harkness in the chair.

Miss Alice Eastwood and William L. Watts were elected resident members.

The following communication was read:

SAN FRANCISCO, April 18, 1892.

Secretary, California Academy of Sciences:

DEAR SIR—The proprietors of Zoe have the honor to offer for acceptance of the Academy 50 copies each of volumes I and II of that journal, to be distributed to the principal societies of the world which are in correspondence with the Academy, in grateful acknowledgment of favors granted to the California Zoological Club and the California Botanical Club.

Respectfully,

H. W. HARKNESS,
T. S. BRANDEGEE,
KATHARINE BRANDEGEE.

The President then introduced Mr. Edward Muybridge, who delivered a lecture on "The Science of Animal Locomotion," with lantern illustration of consecutive phases of animal movements and syntethical reproductions by the zoopraxiscope.

CALIFORNIA BOTANICAL CLUB. *February 25, 1892.* The Vice-President, Mrs. M. W. Kincaid, in the chair.

Brofessor Douglas H. Campbell delivered a lecture on the Origin of Flowering Plants. The lecturer stated that the ancestral forms of all the higher plants are to be sought among the fresh-water algæ. From these were probably developed forms like the simplest of the existing liverworts, and from these the higher forms, Bryophytes, Pteridophytes and Spermaphytes were later derived.

The structure of the simpler liverworts was briefly sketched and the development and fertilization of the archegonium and the subsequent development of the sporogonium described. Attention was called to the motile spermatozoids, and the necessity of water in fertilization, as indications of the aquatic nature of the ancestors of these forms.

Special attention was called to Riccia and Anthoceros as the most primitive in some respects of the liverworts, and the latter was especially spoken of as representing a form like that from which the higher plants have probably come.

The forms were next taken up, and after showing how the prothallium represents the liverwort thallus, and the fern itself the sporogonium, attention was called to the gradual reduction of the sexual prothallium and the increasing development of the sporophyte in the higher forms. It was then shown how this was accompanied by the development of heterospery in several groups, resulting finally in one case, at least, in the production of seed-bearing plants.

Flowers are only groups of special spore-producing leaves, with more or less accessory leaves in the more specialized ones. The simpler flowers are comparable to the spore-bearing leaves of an Osmunda, for example, or a spike of Equisetum. In the heterosperous Pteridophytes spores of two kinds were developed, and these in the flowering plants are the pollen-spores and the embryo-sac. The ovule and anther are simply special forms of sporangia.

In conclusion the influence of two groups of animals—viz., birds and insects—upon the further evolution of flowering plants were

spoken of. These have played an important part in the evolution of these forms as the development of edible fruits and brilliant flowers has undoubtedly been brought about mainly through their agency. As soon as the distribution of seeds and the pollination of flowers became dependent upon these, sharp competition was set up to attract these visitors, and the result we see in the amazing variety of forms now upon the earth.

March 5, 1892. Annual Meeting. The Vice-President, Mrs. M. W. Kincaid, in the chair.

The annual reports of the Secretary and Treasurer were read and ordered filed.

The following officers were elected for the ensuing year:

President—Douglas H. Campbell.

Vice-President—Mrs. S. W. Dennis.

Secretary—Frank H. Vaslit.

Treasurer—Miss A. M. Manning.

Librarian—Mrs. S. W. Burtchaell.

Curator—Miss Edith B. Falkenau.

Councilors—Mrs. L. D. Emerson, Miss C. H. Hittell, C. C. Riedy.

March 24, 1892. J. M. Hutchings in the chair.

The following were elected to membership: Volney Rattan, Miss Kate Hodgkinson, Dr. C. B. Brigham, James Denman, Miss Bertha E. Stringer, Miss Lotta Bean, Miss K. E. Cole, Mrs. L. H. Sharp, Miss Jessie Smith, Mrs. M. F. McRoberts, Theodor Michaelis, Dr. Joseph Pescia, Prof. W. M. Searby.

Mrs. Katharine Bandegee read a paper on the Fertilization of Flowering Plants.

The speaker gave a brief outline of the reproductive processes, as far as understood, of Phanerogamic and Cryptogamic plants, and showed that the latter approached much nearer the animal kingdom by their motile spermatozoids and necessity of fluid media. The fertilization of flowering plants is brought about by means of the winds, by the visits of insects and by the mechanism of the flowers themselves. The first two agencies, especially the second, had, the speaker thought, been unduly credited at the expense of the third. Diœcious and monœcious flowers were necessarily dependent upon the first two agencies, but in the great mass of annual plants, nearly all having hermaphrodite flowers, and so many of

them being in possession of a more or less elaborate mechanism whereby the pollen was brought in contact with the stigma of the same flower, it was logical to suppose that this mechanism was of some service. Attention was called particularly to the Onagraceæ, in many of which the flowers, even those with large and showy corollas were fully fertilized, while the bud was still firmly closed. Numerous instances were given of adaptations for self-fertilization.

Hybrids produced by the crossing of two distinct species rarely persisted in nature, and had not been enough studied. Closely related plants were often much more difficult to cross than more distant ones, the explanation is of course a purely mechanical one, to be sought for in the tissues of the respective plants. In one of the plants here shown, *Œnothera ovata*, which is invariably fertilized in the closed bud, the calyx-tube is from three to six inches in length, and the length of pollen-tube necessary to reach the ovules is an obvious factor in their fertilization. The consistency of the tissues of the stigma has also to be considered.

The term "cross-fertilization" has been very loosely applied in botany. Many use it indiscrimately to signify the crossing of the flowers in the same plant equally with the crossing of plants divergent for many generations. The first use is a misnomer for each plant if not an individual in the sense in which we ordinarily use in speaking of animals, is but a compound entity springing from a single germ.

In the fertilization of flowers by insects, the speaker said that observers preoccupied with the idea that "self-fertilization is injurious or destructive" had overlooked the importance of thrips, aphis and minute larvæ, which often cover the stigma with the pollen of the same flower.

The speaker was assisted by Mr. C. C. Riedy in showing under the microscope peculiar forms of pollen and the emission and entrance of pollen-tubes.

April 26, 1892. Miss Eastwood in the chair.

The following were elected to membership: Miss Kate Howell, E. P. Lynch, Mrs. E. W. Caswell, Miss Ottilie Schücking, Joseph Nordman, Miss Belle Ryan, Miss Edith Fassett, Miss Florence Lane, Miss Emily G. Britton, Mrs. Rowena C. Gray, Luther Burbank, J. Preuss, Mrs. A. B. Rice, Miss Agnes Regan, Miss Nettie Wade, Miss K. T. Callahan, A. L. Mann, B. L. Robinson.

Miss Alice Eastwood read a paper on Loco Weeds.

C. C. Riedy, assisted by W. E. Loy and L. M. King, gave a demonstration of the lower cryptogams under the microscope, ten instruments being used.

CALIFORNIA ZOOLOGICAL CLUB. *January 16, 1892.* The meeting was opened with a brief address by Dr. D. S. Jordon, following which a proposed constitution was read by the secretary pro tem. and adopted by the club. The following officers were then elected for the ensuing term:

President—Dr. David S. Jordan.

Vice-President—Walter E. Bryant.

Secretary—Charles A. Keeler.

Treasurer—Frank H. Vaslit.

Curator—F. O. Johnson.

Councilors—J. J. Rivers, W. E. Ritter, Dr. O. P. Jenkins, Miss Louise Bunnell.

January 30, 1892. President Jordan in the chair.

John Comstock, Professor of Entomology of Cornell and Stanford Universities, entertained the Club with a most instructive lecture on the subject of methods of scientific work, as illustrated in particular by a study of the methods of classification of insects. The speaker called attention to the great influence which the doctrine of evolution had had upon the methods of viewing scientific questions. Before the time of Darwin science had busied herself solely with the classification of species, but at the present time the great aim of scientific research is to trace the history of the changes and modifications in form and structure of parts—to study the function of organs.

If our knowledge of all the groups of organisms was complete it would be a comparatively simple matter to establish relationships, but the record is at best a fragmentary one, so our most satisfactory method is to trace each organ or part through all the stages of its evolution, and try to understand its use, rather than to attempt to follow the transformations of the species as a whole. Prof. Comstock then proceeded to illustrate this method of work by his investigations in the classification of butterflies and moths. He drew attention to the fact that in these insects the wings are covered with fine scales arranged in regular rows like tiled roofing. What can

this minute powder tell us of the history of butterflies and moths? An examination of various species discloses the fact that there is considerable diversity both in the structure and distribution of the scales. Among some species the scales are in the form of slightly flattened hairs, irregularly scattered over the surface of the wings. Between this type and the most specialized form of scale every gradation can be traced; and it is found, moreover, that in species in which the structure of the wings, antennæ and other parts discloses a lowly organization the irregularly disposed hairy form of scale is present. Furthermore, it is found that the specialization of the scale varies upon different parts of the wing.

In order to understand the use of these scales it is necessary to know something of the structure of the wing. The wing of the dragon-fly is cut up by a net work of intersecting veins, but in butterflies and moths the veins are fewer in number and cross-veining is rare. In the dragon-fly the mesh work of veins strengthens the wing, while in the butterflies and moths the scales perform this function. The more flat and regularly disposed the scales are, the greater will be their strength. Accordingly any variation in the direction of a flattened scale will be preserved by natural selection. It is to be expected, moreover, that the greatest change will occur in the region of greatest strain. It is found that this is indeed the case, for the scales are more flattened on the front than on the hind wing, and at the tip more than at the base. As an additional strengthener, ridges have been developed along the scale. Incidentally, these ridges have also been productive of a great variety of iridescent colors, by the interference of light. As soon as these color effects began to manifest themselves, sexual selection would be introduced as a factor in the modification of scales.

Having followed out one line of development it is necessary to correlate this with the evolution of other parts. The classification of insects is based largely upon the structure of the wings. In lower forms the wings are broad and far apart, while higher forms are distinguished by having them closer together and more compact. In order to give still greater strength to the stroke of the wings a bristle or clump of bristles known as a frenulum, is developed near the base of the upper edge of the secondary wing. When consisting of a bundle of bristles each one is a hollow tube, but when formed of but one bristle it is composed of a number of tubes joined to-

gether. It thus becomes apparent that the latter is a higher structure than the former, being composed of a bundle of bristles united into a single spine. Very frequently the female will have the frenulum in the form of a bundle when the male has but a single bristle. The reason of this is obvious, for the male is called upon to make greater use of its wings in flying in search of the female, and thus requires a more perfect structure.

Sometimes the base of the hind wing is extended up in the form of a shoulder binding the two wings together, and thus replacing the frenulum. In the silkworm moth there is a lobe at the base of the wing and a mere rudiment of a frenulum; even in the male this frenulum consists of a bundle of hairs, such as is present in the female of most species. It is an interesting fact that degeneration seems to directly retrace its steps of progress, as indicated by the above example. One moth, *Hepialis*, which is in some respects rather lowly organized, was found to have neither frenulum nor lobe. In place of these a sort of loop or thumb was found upon the front wing which Prof. Comstock has termed the jugum. This jugum occurs also in *Micropteryx*, in which genus an elaborate arrangement exists to receive it.

The speaker concluded from the above facts that the *Lepidoptera* had developed along two distinct lines distinguished by the style of organ used in binding the wings together, and he accordingly proposes the division of the order into two suborders, the *Jugatæ* and the *Frenatæ*. From all this it may be learned that a true system of classification must be based upon a study of the uses of parts.

February 27, 1892. Dr. Jordan in the chair.

After the reading of the minutes Dr. H. W. Harkness was called to the chair, while the president addressed the club on The History of the Zoological Explorations of the Pacific Coast.

The lecturer was chiefly confined to a historical review of the work which has been done on the fishes of the coast. The substance of the talk was as follows:

The first person associated with the study of the fishes of the coast was the German naturalist Steller, who was sent by the Russian Government in 1731 to study the animals of Alaska. Notable among his discoveries was the great arctic sea-cow *(Rytina stelleri)*, a skeleton of which is now owned by the Academy of Sciences.

He published an account of the salmon of Alaska, describing five species in all, under Russian names. These five species still stand, and nothing new has since been added to our knowledge of the salmon of the coast. He also studied the trout and his conclusions have proved in general correct. Indeed, there has not since that time been a stronger man on this coast, and every ichthyologist must do honor to the ability of a man who was able to follow out all the complicated species of salmon and trout, before the time of Linnæus.

Walbaum, a compiler of natural history, affixed scientific names to these salmon and trout in a work published in 1792, and his name is accordingly cited as authority for the species which Steller discovered and described.

Another naturalist in the employment of the Russian Government, named Pallas, printed in 1811 an account of his explorations in the same country that Steller had visited, but his work was apparently not very highly appreciated at the time, for it was not distributed until twenty years later. Pallas' trip across Siberia was notable for the discovery of the mastodon in the ice. His work was carefully done, consisting largely in authenticating by repetition the work of Steller, although he also discovered many new species in Alaska.

The above period may be considered as constituting the prehistoric epoch in the history of Pacific Coast explorations. In the second stage may be mentioned the work of Gairdner and Kittlitz. About the year 1830 Dr. Gairdner, a physician living in Astoria, collected many fish, especially salmon and trout, which he sent to Sir John Richardson to be described in his classic Fauna Boreali Americana. At about the same time an unknown German named Kittlitz recorded a single new species of fish.

In 1849 the modern history of California began, and with the host of emigrants that flocked to the Pacific Coast came a number of men interested in natural history. In the year 1852 a number of papers appeared on science, the most extensive and spirited writing being done by Dr. W. O. Ayres. His papers, as was customary at the time, were first presented to the California Academy of Sciences, appearing on the following morning in the Daily Placer Times. These papers have since been reprinted in the regular Proceedings of the Academy. Dr. Ayres described a considerable number of new species of fish from the coast in a very creditable

manner, but the severe criticisms of Dr. T. A. Gill eventually drove him out of the work.

Dr. W. P. Gibbons, of Alameda, about the year 1854, became interested in the most unique feature of the ichthyology of the Pacific —viviparous fish. Some twenty species of viviparous surf fish are known from the Pacific Coast of America, and with the exception of two others found in Japan, form a unique group. Dr. Gibbons described all the species he knew, but at about the same time Prof. Louis Agassiz received specimens which he also described. Much difficulty and confusion has thus resulted in regard to the priority of names, although in the majority of instances it has been determined that Agassiz had priority of date. Agassiz also published the first descriptions of many species of fish from Washington and Oregon, although he never visited the coast himself.

Dr. Charles Girard, who was connected with the Smithsonian Institution, also described a number of the viviparous fish, which served to increase still further the difficulty of establishing priority of names.

Allusion was next made to the work of Dr. J. G. Cooper, who was present at the meeting. Dr. Cooper began work in 1856, on the fishes collected on the Geological Survey, mostly from the southern part of the State, and much of the early investigations in that region were due to him. He described, among other things, the most vicious of the sting-rays from the harbor of San Diego, naming it after a young boy who had the honor of being the first person known to be stung by it.

The Pacific Railrord survey was finished early in the fifties, and the fishes were described by Dr. Charles Girard, a pupil of Agassiz. Despite his unusually good facilities in the way of specimens and books, he did no really good work. He described a vast majority of the fishes of the coast, but in a very wooden way which proved a great set-back to the study of ichthyology. Girard indeed did all a man could do to make it difficult to determine the trout.

Andrew Garet was at the Academy at about this time, but he did no work on the fish of this coast excepting the description of one new species from Mexico. He contributed some valuable additions to our knowledge of the fishes of the Sandwich Islands, however.

George Suckley, a surgeon in the War Department, was stationed in Washington and Oregon, and suppiemented the work of Girard

on the fishes of that district. He succeeded in carrying the confusion to an extreme, making as many as three genera from a single species of salmon, founded on differences of age and sex.

Dr. Theo. N. Gill, who has been connected with the Smithsonian Institution for the past thirty years, has published descriptions of many fish that have been sent him, although he has never made any collections on the coast personally. Being the most learned student of fish in America, he has occupied a unique position as a critic, and is undoubtedly the best scientific critic the world has produced.

In 1865 Alexander Agassiz wrote a work on the viviparous fish of the coast, settling most of the disputes in regard to priority of names. This closes the period of the discovery of California fish. The presence of the viviparous surf-fish and the viviparous rock-cods, and the other general outlines of the coast fish, were by this time generally known, although but little attention had been paid to the species inhabiting the deep seas.

In the present period Prof. Cope has described a number of new species, mostly from Alaska. Dr. Steindachner, a brilliant German scientist, found a number of new species. He investigated the salmon question to some extent but gave it up as a hopeless task and published nothing on the subject. Most of the fish which he described were from Southern California and Mexico, his work being for the most part very accurate and his figures unparalleled for the fineness of their execution In 1879, a versatile Englishman, an editor, engineer, poet and naturalist, was at work in the Academy. He described a number of new species and made a critical study of the flounders of the coast.

"In 1880," said the speaker, "it was my good fortune to be sent by the United States Fish Commission to make a survey of the fishes of the coast, abundant facilities of every sort being provided." Seventy-five new species were discovered and the salmon question was settled, practically as it had been left by Steller. Prof. Gilbert, who was his clerk and assistant, has since become very prominent as an ichthyologist. He has spent two years at work on the Albatross, making many important contributions to our knowledge of the deep sea fishes of the Pacific.

Dr. T. H. Bean visited Alaska in 1880, and reached the same conclusions regarding the trout of Alaska that the speaker had drawn from his studies of the California fish. Mr. E. W. Nelson

also made a good many observations upon fish while stationed in Alaska. In San Diego Miss Rosa Smith worked on fish, and has the honor of being the first woman to describe any new species. Dr. Eigenmann carried on work at San Diego and San Francisco, and accomplished considerable on the study of the fish of these places.

For the last three years the United States Fish Commission Steamer Albatross has been at work on deep sea soundings and dredgings, Mr. C. H. Townsend being the naturalist of the vessel during all this time. The results of these dredgings have been of great importance, about three hundred new species having been discovered, many of them very startling and impossible forms. The whole fauna of the abyssal deeps is very strange and peculiar. The fish are soft-bodied and have either very large eyes to enable them to catch the faint glimmerings of light which may reach them, or else are entirely blind. Many species are provided with curious phosphorescent lanterns to enable them the better to find their way about. Practically nothing was known of these remarkable fish before the work of the Albatross brought them to light. Occasionally one would be found washed ashore after a storm, or in the stomach of some larger shore fish, but by far the large proportion of them were totally unheard of.

March 26, 1892. Mr. J. J. Rivers in the chair.

Mr. Wm. E. Ritter delivered an address giving an historical account of the development of Tornaria, and of Balanoglossus from Tornaria. The affinities of Tornaria to the larva of Echinodermata and of Balanoglossus to Amphioxus were pointed out. One of the chief purposes of the paper was to call the attention of the members of the club to the possibility of finding Tornaria upon this coast, and the speaker described the indications of its presence. It is found upon silty beaches between tides buried in sand or mud, and may always be recognized by the peculiar pyramidal coil of the cast which is thrown out.

ZOE

A BIOLOGICAL JOURNAL.

VOL. III. JULY, 1892. No. 2.

CONNECTING FORMS AMONG POLYPOROID FUNGI.

BY LUCIEN MARCUS UNDERWOOD.

Read before the Indiana Academy of Science December, 1891.

As a prelude to this preliminary paper on the generic limits of the Polyporei, we wish to call attention to some of the anomalies in the pronunciation of the plural of *fungus*. The novice, innocent of classical erudition, usually essays it as *fŭngī;* the classically minded man brings it out as *foon-ḡee*, while a growing tendency, fathered at Harvard, fostered at Cornell, and by them distributed far and wide is *fŭnġē*. This last is (1) a hybrid and (2), a monstrosity, and should be relegated to the department of teratology. Clearly two forms are allowable. If with our classical friends we believe that some novelty must be instilled into a dying tongue, then the melodious (?) *foonḡee* may be used. But since English is destined to take the place formerly held by Latin as the universal language of science, we deem it more logical as well as involving more common sense to say *fŭnġī*.

The oldest genus of this family is Boletus established by Dillenius in 1719[1]. In this genus Linnæus included all the "Pore-fungi" known to him, passing over Polyporus established by Micheli in 1729[2]. Haller established Merulius in 1768[3], and Bulliard added Fistulina in 1781[4]. When Persoon gave his systematic survey of the fungi in 1801[5], three genera were recognized. Of these he established Dædalea and adopted Merulius (under which he placed Cantharellus, Adans. as a sub-genus), and Boletus (under which he

[1] Cat. Giss. 188.

[2] Nova Plantarum Genera, 129.

[3] Helv. em. 150.

[4] Champ. I, 314.

[5] Synopsis Methodica Fungorum.

included as sub-genera Fistulina, Polyporus and Poria). Fries in 1821[1] recognized five genera: Merulius, Dædalea, Polyporus, Boletus and Fistulina; in 1836[2] he added Trametes, Cyclomyces, Hexagonia, Favolus and Porothelium, and retains essentially the same arrangement in his Opus Maximus in 1874[3]. Berkley separated Strobilomyces from Boletus in 1860[4], and Kalchbrenner set apart Boletinus in 1873[5]; in this he has been followed by Peck,[6] who has made a special study of the American forms. Later writers have been more profuse in establishing genera. Peck[7] established Myriadaporus, which is based on an apparently monstrous growth; Karsten in 1881[8] from a study of the flora of Finland alone established eighteen new genera; Schrœter in 1888[9], while adopting only a few of Karsten's new genera, added three of his own from the flora of Silesia; Ellis and Everhart[10] have separated Mucronoporus based on the exceedingly slender character of pubescence of the interior of the pores! following a doubtful analogy to Hymenochæte, and last of all, M. C. Cooke has separated Sclerodepsis[11] from Trametes, a genus which already lacked any marked characters to separate it from Polyporus.

[1] Syst. Mycol. I, 6.

[2] Genera Hymenomycetum.

[3] Hymenomycetes Europææ.

[4] Outlines of British Fungology, 236.

[5] Icones Selectæ Hymenomycetum Hungariæ, 52.

[6] Bulletin New York State Museum, No. 8 (1889).

[7] Bull. Torrey Bot. Club, xi, 27 (1884).

[8] Enumeratio Boletinorum et Polyporearum Fennicarum, systemate novo dispositarum, *Rev. Mycol.* 1881. The genera are Tylopilus, Cricunopus, Tubiporus, Rostkovites and Krombholtzia, among the Boletineæ; and Polypilus, Tyromyces, Polyporellus, Ganoderma (founded on *Polyporus lucidus*), Piptoporus (founded on *P. betulinus*), Fomitopsis, Bjerkandera (including *PP. adustus*, *hirsutus*, *versicolor*, *abietinus*, etc.), Antrodia, Hapalopilus, Pycnoporus, Caloporus, Ischnoderma, and Inonotus, among the Polyporeæ.

[9] Kryptogamen Flora von Schlesien, Pilze, i. The genera are Ochroparus, Phæoporus and Dædaleopsis, the last founded on *Dædalea confragosa*. Schrœter also separates *Merulius lacrymans* under Serpula Pers. (1801, as sub-genus), revives Suillus Mich. (1729), and further includes all of Lenzites among the Pylyporei.

[10] Jour. Mycology, v, 28 (1889).

[11] Grevillea, xix, 49 (1890).

To one who has made any considerable field study among the Polyporei their most striking peculiarity is extreme variability owing to habitat, state of growth, seasonable conditions and many other circumstances of environment. When *Polyporus hirsutus*, for instance, grows on the upper side of a log its pileus tends to produce a complete circle, thus reducing its attachment to a short central stem; when it grows on the side of a log its pileus has the normal semicircular form, but when it grows beneath the log it is reduced to a completely resupinate condition. And yet these forms represent three of the five subgeneric sections of Polyporus as usually recognized! It is easy to see how closet botanists poring over some herbarium fragments of pore-fungi, pour forth new species and genera by the score.

The connecting character of the family has long been noted. In 1836 Fries writes: "*Prorsus intermedii inter Agaricinos et Hydneos*[1]." Peck[2] has given an extended discussion of the intermediate character of the variable *Dædalea confragosa* showing its intimate relations to the three genera, Polyporus, Trametes and Lenzites. Two other common species of Dædalea possess also intermediate characters. *D. ambigua* is clearly in the form of its pores a species of Dædalia, but in its texture and other characters it is a species of Trametes with which indeed Fries had united it. *D. unicolor*, especially in its older stages, can scarcely be distinguished from an Irpex. Polyporus is also connected with Irpex through two variable and closely allied species, *P. abietinus* and *P. pergamenus*. Indeed these species are so closely related in some of their forms that their chief difference consists in one uniformly growing on the wood of Coniferæ and the other on the wood of deciduous trees! The lacerate pores of these species are often difficult to distinguish from the flattened teeth of Irpex.[3] Polyporus is further related to Lenzites through a polyporoid form of *Lenzites sepiaria* which, taken apart from its evident connections, would form an excellent species of Polyporus.

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[1] Epicrisis, 408.

[2] 30th Regents Report, 71.

[3] Peck (42d Regents Report, 38), has described var. *irpiciformis* of *P. abietinus* and calls attention to a second form of this species, which has been described as (*Irpex fuscoviolaceus*).

Through Strobilomyces, whose habit, combined with structural characters, is perhaps sufficient to keep it distinct, Polyporus passes to Boletus, and from Boletus there is a gradual connection through Boletinus, which stands on uncertain footing, to Paxillus, another genus of Agarics. Through Merulius with fold-like pores still another passage is made to the Agarics in the direction of Cantharellus. Sufficient has been said to verify the assertion of Fries, that the family is intermediate between the Agarics and the Hydnei.

A few conclusions may be drawn from the preliminary survey:

1. Among the Polyporei at least, Gœthe's statement that species are simply creations of the text-books, finds abundant illustration and warrant.

2. Generic and family limits are also exceedingly vague. Many of the genera are simply form-genera, and there is an amazing variety of connecting forms.

3. Several of the genera of Polyporei, as commonly accepted, have no rational basis on which to stand. From the genus Polyporus thirty genera could easily be formed with as valid reason as several that now exist. When characters are so poorly defined it seems a more rational proceeding to leave forms in few large genera than to establish new genera on characters that would ordinarily be regarded as merely specific. In regard to some of these genera we will specify changes:

(a) Trametes, with "trama descending between the pores," hangs on an exceedingly slender thread and had better be reunited with Polyporous. Though an error, it is perhaps significant that Saccardo describes *Polyporus cinnabarinus* under both Polyporus and Trametes[1].

(b) *Glœoporus*, with "gelatinous hymenium," has no more reason to be separated from Polyporus than *P. lucidus* has to be erected into a genus because it has a varnished skin[2]. It had best be returned to its original fold unless the South American forms reveal something more unlike Polyporus than has yet been discovered in the United States.

(c) Favolus, with "large angular pores," cannot stand as a genus if *Polyporus squamosus*, *P. lentus*, *P. arcularius*, and their allies,

[1] Sylloge Fungorum, vi, 245, 353.

[2] Cf. Karsten *loc. cit.*

with pores just as large and just as angular, are to remain in Polyporus. We suspect that the same is true of Hexagonia, but we have seen too few species of that genus to form a definite conclusion.

(d) Mucronoporus, with spines within the pores, stands on about as valid ground as would a genus established on *Polyporus hydnoides* and characterized by the bristly hairs which thickly cover its pileus. Were the systematists among the flowering plants to divide every genus that possessed both glabrous and pubescent species, there would be even more hair-pulling in their ranks than has yet appeared.

(e) The subdivision of Polyporus on the basis of the color of the cortex and spores, as proposed by some continental botanists[1], is no more rational than to divide Viola into three genera to contain the blue, yellow and white flowered species respectively.

(f) No more rational is the sub-division of the same genus into Fomes, Polystictus and Poria. This seems to have been attempted by Fries[2] as a sort of experiment, but was not continued by him in his Opus Maximus,[3] nor other later writings. M. C. Cooke resurrected this classification in his Præcursores,[4] and he was almost immediately followed by Saccardo[5]. A few American mycologists, who do not seem to appreciate that Saccardo's Sylloge is a convenient compilation rather than a critical conspectus, have also adopted it bodily.

4. Dædalea will probably have to be united with Lenzites, but whether this united group will be agaric with polyporoid affinities, or polypore with agaricoid affinities, it would be hard to decide with the light thrown upon the genus by American species.

5. The genera about which there is no present suspicion are, so far as our flora is concerned, Polyporus, Boletus, Fistulina, Solenia, Merulius and perhaps Strobilomyces. Porothelium and Cyclomyces are not sufficiently known to us to permit a judgment.

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[1] Cf. Schrœter *loc. cit.*

[2] Novæ Symbolæ Mycologicæ, 1851.

[3] Hymenomycetes Europæ, 1874.

[4] Præcursores ad Monogragraphia Polyporovum, Grevillea, xiii, 80-87, 114-119; xiv, 17-21, 77-87, 109-115; xv, 19-27, 50-60 (1885-6).

[5] Sylloge Fungorum, vi.

GEESE WHICH OCCUR IN CALIFORNIA.

BY L. BELDING.

The earlier writers credited this State with five forms of geese. These are now known to ornithologists as *Chen hyperborea*, *Anser albifrons gambeli*, *Branta canadensis occidentalis*, *B. canadensis hutchinsii*, and *B. nigricans*. In the fall of 1878 I sent a specimen of *Chen rossii*, which I got at Stockton, to the National Museum. It may have been collected here previously, but this was the first that I know of.

Number 76,654 of the U. S. National Museum, published in Partial List of Birds of Central California, under the name of *Chen albatus*, was probably a juvenile *C. hyperborea*, but I am not quite convinced that such is the fact. I think Mr. Ridgway ascertained that *albatus* is a synonym of *hyperborea*.

In 1885 Mr. Ridgway gave the smallest goose of the *canadensis* pattern of coloration the name of *Branta minima*, but afterward, during the same year, reduced it to subspecific rank, with the name of *B. canadensis minima*. A year or two later Mr. C. H. Townsend published the fact that Mr. Fiebig had collected *Philacte canagica* at Eureka, and during the past winter Mr. Ridgway identified parts of a goose I sent the National Museum from Stockton as belonging to a true *Chen cærulescens*.

Besides these, I believe the typical *Branta canadensis* occurs in California, but doubt if any specimen is in existence to prove the correctness of this opinion.

It may not be inappropriate in this connection to remind the ornithologists of California that we need a collection that contains a series of every American bird, and that without such a collection efforts to progress are unnecessarily difficult and will continue to be unsatisfactory.

Lesser Snow Goose. *Chen hyperborea.* This is the very abundant white goose, which breeds in Alaska; reaches California about the first of October (Stockton Sept. 29, 1881; Gridley Sept. 30, 1884; Stockton Sep. 28, 1886), and leaves for its northern breeding grounds about the middle of April, a few remaining as late as the first of May.

At Stockton, in 1880, I saw the last flock April 30. They had been rare since the twentieth. They were last seen at Gridley April 28,

1884, and were last seen at Chico by Mr. Proud on April 27 of the same year. They sometimes enter California from the east slope in Nevada and leave in the same direction, probably stopping awhile about the numerous lakes of Nevada and northeastern California.

Mr. Evermann says it is an abundant winter resident of Ventura County. It was abundant in the northern part of San Diego County in the winters of 1884 and 1885, and Mr. Morgan told me he saw a great many of these and other geese at Ensenada, and on the head of the Gulf of California in the winter of 1883–84, which is probably about as far south as it goes on this coast.

BLUE GOOSE. *Chen cærulescens*. Two of these geese were shot, one day, about February 1, of this year, by two hunters who were hunting together near Stockton. Mr. M. J. Shaw of the game market kept one of them on exhibition as long as he could, and then saved the head and neck, wings and legs. These fragments were all that I saw of the bird, and these I sent to Mr. Ridgway for identification. He said it was a true *Chen cærulescens*—a juvenile.

There was no white or light shade on the chin, nor on any part that I saw, and several persons who saw this goose before it was dismembered told me it was entirely blue except the quills. These were brownish-black. The blue was nearly that of the sand-hill crane. The wing measured about 15, tarsus 3, middle toe and claw very nearly 3, the naked culmen 2 inches.

I think the blue goose has not heretofore been reported in California, though my belief has been for nearly ten years that I have occasionally seen the plumage which is attributed to the adult, a few of which I shot, besides some I had seen in market, but the plumage of the uniform blue bird described above is new to me, as it was to many sportsmen and others who saw Mr. Shaw's specimen.

ROSS'S SNOW GOOSE. *Chen rossii*. This diminutive white goose can readily be separated from any other form, being much smaller than any and having a warty appearance at the base of the bill. They weigh each about two and one-half pounds, have light colored flesh and are very palatable.

They breed in Arctic America, arrive in California with, or about the same time other white geese arrive, and probably go as far south

as they do, though I believe it has not been recorded south of Ventura County, where Mr. Evermann noted it as being frequent in winter.

My earliest notice of arrival is October 6, at Stockton, when I saw more than a dozen in market. It is a regular winter visitant to California and may nearly always be found in the Stockton market, as long as any of the wild geese are kept for sale. In the coldest weather few geese can be found in the interior of the State, north of Stockton.

Its notes are different from those of the other white geese. I kept a "winged" pair several months, which always resented undue familiarity. The male would always lead the female away from me and utter a strange grunting dissent if I got within a few feet of them. They had been captives a year already when I got them and must have had some sad experience, for I have known individuals of this species to be very tame. One day I found a nest in a pile of rubbish in the poultry yard, which had six eggs in it. The eggs were concealed with a covering of straw in regular goose fashion, and there were no other geese in the yard. I had several times seen the pair about this part of the yard and thought they might have a nest there, but the eggs I found were so much like hen's eggs in shape, and appearance of the shell, that I thought they might be hen's eggs. I never solved the problem, a young zealous egg-gathering lad having discovered and appropriated them. The pair finally escaped from neglect to keep their wings clipped.

AMERICAN WHITE-FRONTED GOOSE. *Anser albifrons gambeli.* This is known by hunters as the speckled-belly and yellow-legs. It breeds in the Arctic regions, and, according to Mr. Fannin, as far south as Vancouver Island. It is the first goose to arrive in California and the last to leave, staying a little longer than the white geese; is very abundant and fairly good for the table. It arrived at Stockton Sept. 7, 1878; Sept. 8, 1881. My latest spring record for it here is May 3. A great many passed Stockton the previous day on their way north.

Mr. Bryant found it as far south as Guadalupe Island in winter, and I heard of four near Cape St. Lucas, but the latter was exceptional.

Its early arrival in California is nearly every fall announced by the newspapers of the interior as an indication of an early winter.

In 1884, the Sacramento Record-Union of Sept. 2 noticed the arrival of geese, which were unquestionably of this species.

It is sometimes named the laughing goose, a name probably derived from its notes rather than from its gaping mouth.

CANADA GOOSE. *Branta canadensis.* Mr. Fannin says: "It is a very abundant resident of British Columbia, breeds throughout the interior of the mainland, appears in great flocks along the lower Frazer River during the winter months and affords fine sport for the hunters."

Dr. J. C. Merrill in the Auk of April, 1888, says (at Fort Klamath): "Of *occidentalis* I saw none, although they doubtless occur here. *Canadensis* seemed to be typical."

Like *Otocoris alpestris merrilli* and other birds, the Canada goose probably crosses the mountains and spends the winter in the Sacramento Valley, and perhaps in other parts of this State. In Yuba and Butte counties I have occasionally during many years noticed small, paler flocks of "Honkers," which reminded me of those I had seen and shot on the Illinois and Platte rivers.

HUTCHINS'S GOOSE. *Branta canadensis hutchinsii.* This for convenience on this occasion, we will call the medium-sized honker. It breeds in Alaska.

It is very abundant in the State in winter, arriving in the Sacramento Valley about the tenth of October. My earliest fall notice of it in Butte County is Oct. 9, 1884, at which time it was abundant. In the fall of 1891 I did not see or hear it until about Oct. 20, and my observations accorded with those of the market hunters on Butte Creek. It remains in the Sacramento Valley until about April 20, sometimes a few days later.

It goes about one hundred miles south of San Diego, according to Mr. Anthony, and is numerous in parts of San Diego County in winter.

Its notes are unlike the notes of *occidentalis*, and are also different from the notes of *minima*. I think it varies more in size than the latter, and that this variation is responsible for the difficulty experienced by some writers in separating them.

This goose was abundant during March, 1892, on Butte Creek, and about Gridley, but I did not hear or see *minima*. I have often seen them in separate flocks, but I oftener see these, like other geese, in large mixed flocks of various kinds.

White-cheeked Goose. *Branta canadensis occidentalis.* This is the "Honker" of California hunters.

It is abundant in the State in winter, though not nearly as numerous as several other kinds of geese. It seldom arrives before the middle of November, sometimes considerably later, and not until comparatively cold weather sets in. It begins to leave usually about the middle of March, and I have seen a flock going east over the snow-covered Sierra Nevada as early as Feb. 22, 1887, during a mild sunny morning when I was hunting just below the snow line in Calaveras County, as I have often seen them going here and in Yuba County under similar conditions.

In Partial List of Birds of Central California, I am credited with the statement that this goose comes to this State and leaves it about same time that the American white-fronted goose does—one of the very few errors in that paper, which was otherwise very satisfactory to me. In that paper I mention that I have often seen this goose crossing the mountains (and leaving) about the middle of March, which partly corrects the error which must have occurred by an incorrect reading of my writing. I have not seen this goose as far south as San Diego County, but Mr. Morgan told me he had seen a flock of about a dozen at La Hoya, twelve miles north of San Diego, and had shot several of them.

I first saw it in market at Stockton Nov. 11, 1880, Nov. 23, 1881; at Gridley, Dec. 2, 1885.

It breeds sparingly in a large marsh at Tallac Point, Lake Tahoe, or did so recently; at Pyramid Lake and other lakes in the Great Basin, on the east slope of the Sierra, and is the only goose which is known to breed in any part of California. Its breeding habitat is much more southern than that of any other of the geese.

Mr. Fannin, in his Check List of Birds of British Columbia, refers to a single specimen taken in the interior of B. C., from which I conclude that he considers it rare in the province.

Cackling Goose. *Branta canadensis minima.* This, the smallest goose of the honker color, is perhaps more abundant than any goose found in the State. On Butte Creek, a favorite resort for geese especially when they first arrive from the north, I am confident that I have seen a half a million of these geese in a single day. They arrive there from the first to the tenth of October; were already numerous Oct. 1, 1884. In the fall of 1891 it was in considerable force there, about two weeks before *hutchinsii* arrived.

My earliest Stockton date of its coming south is October 12; my latest spring record is April 25.

Mr. Morgan told me it arrived at Ensenada Oct. 12, 1884, and that he afterward saw it on the Blythe estate on the Gulf of California. I have seen it in San Diego County, and believe it goes as far south as Hutchins's goose.

The notes of *minima* are much higher in pitch than are those of *hutchinsii.* I noticed this the first time I ever saw them, in the year 1856, and upon asking my experienced hunting companion the name of a flock of *minima*, as it darted and tumbled in great disorder into the water, uttering the oft repeated notes which Mr. Nelson calls "luk-luk," he said it was the little squeaking goose, a name which I tried to give it in Partial List of Birds of Central California, but by an error the name was printed squawking goose. This goose is apparently generally known and distinguished from its larger cousins by the sportsmen of the State. Cackling goose is an appropriate name for it. I think it a good species. It breeds in Alaska.

BLACK BRANT. *Branta nigricans.* This is a coast species, and I doubt very much if it ever goes inland. It breeds on the arctic shores of Alaska, and scatters along the coast to about three hundred miles south of San Diego in winter.

I have not seen any of the species between San Francisco and the vicinity of San Diego, but a short distance north of San Francisco, at Bodega Bay, Mr. Palmer found it in abundance in March, 1885.

It leaves Alaska and comes south between the middle and last of September, according to Mr. Nelson, and remained at San Quintin Bay to May 9 or 10 in 1881, though it dissapeared from San Diego Bay April 15, 1884, and April 7, 1885, its departure having probably been hastened by the persecutions of the hunters.

It was until recently abundant in San Diego Bay in winter. Its flesh has an oily or fishy taste.

EMPEROR GOOSE. *Philacte canagica.* Collected at Humboldt Bay in the winter of 1884 by Mr. Fiebig. This is the only known occurrence of this northern species in California.

NOTES ON THE TENEBRIONIDÆ OBSERVED IN SAN DIEGO COUNTY.

BY F. E. BLAISDELL.

Edrotes ventricosus Lec. A short, robust, and very convex species, found in the Colorado Valley, which includes the eastern or desert portion of the county. It is wingless and sparsely clothed with long hairs.

Triorophus lævis Lec. Occurs in the northwestern portion of the county. The species is apterous, and has the facies of an Otiorhynchide.

Stibia ovipennis Horn. Inhabits the seashore and is found beneath the beach-berry *(Mesembryanthemum æquilaterale)*, growing upon the sand dunes. This species differs from *maritima* in its larger and more robust form, smaller eyes, and larger, stronger elytral punctures.

Stibia maritima Casey. Inhabits the Coronado peninsula, not confined to the seashore. Moderately common, rarely blackish in color.

Eurymetopon rufipes Esch. Occurs in the central and eastern portions of the county.

Eurymetopon convexicolle Lec. Oblong-oval in form, and black in color. Very abundant beneath bark of trees and any object resting on the ground—as boards, rocks, etc. Feebly pruinose when first captured, although, the older the individual the less the liability to being so.

Eurymetopon inflatum Lec. A broad, elliptical species, ocurring in immense numbers in the sand dunes beneath the beach-berry and other maritime plants. Varies greatly in color, from black to pale ferruginous.

Emmenastus longulus Lec. An elongate-oval species, highly polished, varying in color from blackish to rufo-piceous, and generally strongly pruinose when observed in nature. Occurs abundantly beneath the bark of trees and shrubs, less numerous beneath boards and stones.

Emmenastus piceus Casey. An oblong, robust, parallel species, and dark in color. Have taken this species in the mountains about Julian, at an elevation of about 6,000 feet. A less typical form occurs at Poway (elevation 700 feet).

Emmenastus obesus Lec. A small robust species, piceous-black in color, and very pruinose while living. Very plentiful about San Diego, and generally found beneath dry cow manure, or boards, rags, etc.

Epitragus pruinosus Horn. Young individuals are quite pruinose, but on account of the polished surface of the integuments, it soon wears away. Not plentiful. Have taken it in my net from *Rhus laurina*, also beneath bark at the base of rotten trees.

Zopherus induratus Casey. Occurs in the mountains about Julian, where conifers and oaks are plentiful. The species is black, robust and convex, elytra somewhat shining. Length, 16.5 mm.; width, 7.0 mm.

Phlœodes diabolicus Lec. An oblong, indurate species, common in timbered districts. Have observed the larva and pupa in the rotton stumps of *Quercus agrifolia*. The adult insect feeds upon a large and tough species of fungus which grows upon the oak. Once I took thirty specimens from one large fungus growing on an oak stump.

Noserus plicatus Lec. Occurs beneath the bark of dead trees, in the mountains about Julian.

Anepsius delicatulus Lec. A small, elongate, apterous species. Rather common in maritime districts; have never taken it far from the coast, although it is said to occur in semi-desert regions. It varies in length from 3.5 mm. to 5.0 mm.

Nyctoporis carinata Lec. An elongate, rough insect. Elytra sculptured with several rows of sharp elevations. Occurs under the bark of trees. About San Diego it inhabits the shrubby hill-sides, and can be found under the bark or leaves at the roots of the plants; also, in the sticks and debris that make up the nest of the wood-rat.

Cryptoglossa verrucosa Lec. An interesting form which occurs in the desert region of the county.

Centrioptera asperata Horn. Rare. Occurs at Poway and is nocturnal in its habits.

Microschatia inæqualis Lec. A robust, apterous species. Plentiful throughout the county. Occurs in spring, beneath boards, rocks, etc. Travels about during the day.

Asida ægrota Lec. Inhabits the desert region. Active at evening.

Asida obsoleta Lec. Occurs in the valleys of the central portions of the county. It is said to have been found at San Diego, but I have never observed it so near to the coast.

Asida muricatula Lec. Abundant at San Diego in August, beneath dry cow manure, boards, stones, and old tin cans. The domestic fowl have caused it to retreat to uninhabited districts.

Asida angulata Lec. Common throughout the county. A large black species, resembling *Eleodes* but quickly recognized by the angulate sides of the prothorax.

Coniontis elliptica Casey. Although this form is considered identical with *robusta*, I believe in its validity. The typical *robusta* occurs at Santa Barbara. A careful comparison of the two forms ought to convince the most skeptical as to their being specifically distinct.

Coniontis subpubescens Lec. Occasionally met with. Conspicuously pubescent. Length, 9.2–10.8 mm; width, 4.2–4.8 mm.

Coniontis parviceps Casey. Common about San Diego. Conspicuously pubescent. Length, 7.0–8.0 mm; width, 3.4–4.0 mm.

Coelus globosus Lec. Common in the sand dunes along the seashore. A species that varies greatly in form and size; probably some are valid species.

Eusattus reticulatus Say. There are undoubtedly two distinct species about San Diego. One form, which I consider the present species, has the broad prothorax of its immediate congeners; the other has a narrower prothorax with rather strongly convergent sides, relating it to *muricatus;* the epipleural characters agree with the present idea. The elytral sculpturing in the two forms is different; in the former the surface is raised into a net-work of ridges, while in the latter the surface is quite smooth, although there is a tendency to rugulosity. This form may be *difficilis.* Specimens have been identified for me by Dr. Horn, who pronounced them *reticulatus*; similar specimens were pronounced *difficilis* by Thos. Casey; in both instances they were the specimens with broad thoraces. Somebody is wrong—a problem for the future.

Eleodes quadricollis Esch. A form referred to this species is com-

mon throughout the county. Typical specimens in my collection were collected at San Francisco.

Eleodes gentilis Lec. Very abundant at San Diego.

Eleodes interrupta Blais. Related to the preceding species, but differing widely from it in elytral sculpturing. Rare. Occurs at San Diego.

Eleodes femorata Lec. Very rare. Occurs about San Diego Bay.

Eleodes grandicollis Mann. A large species, moderately common, throughout the county.

Eleodes gigantea Mann. A large elongate species, met with in all parts of the county that I have visited.

Eleodes acuticauda Lec. Common, especially in the interior.

Eleodes laticollis Lec. Moderately common at Poway.

Eleodes parvicollis Esch. Moderately evenly distributed.

Eleodes parvicollis var. *producta* Lec. Plentiful about San Diego. Inhabiting the shrubby hill-sides. They frequent the wood-rats' nests.

Eleodes marginata Esch. Moderately rare.

Cerenopus concolor Lec. Common in the eastern portion of the county.

Cerenopus costulatus Horn. Less common than the preceding species, and inhabiting the same region.

Eulabis pubescens Lec. Common everywhere. Frequents the vicinity of ants' nests.

Eulabis laticornis Casey. Rare. Occurs at Poway, beneath rocks near ants' nests.

Eulabis rufipes Esch. Common. A small species found beneath debris and bark of trees and shrubs. Evenly distributed.

Eulabis obscura Lec. A dark, depressed species, occurring plentifully along the seashore.

Amphidora littoralis Esch. Common in some localities in the interior. Frequents groves and is found beneath rocks, logs, and bark. The name is a misnomer, as I have never observed it along the seashore.

Amphidora nigropilosa Lec. Occurs along the seashore and in

regions immediately adjacent. Common on alkaline flats beneath any object upon the ground. Immature individuals while the integuments are yet soft, ascend small plants in the warm sun during the day, undoubtedly to hasten the hardening of the skeleton.

Cratidus osculans Lec. Common throughout the county. Frequents ledges and timbered districts. At Coronado they are plentiful in wood rats' nests, and about the roots of *Rhus integrifolia*. The species is clothed with moderately long hairs of a pale tawny yellow color.

Cratidus fuscipilosa Casey. Occurs on the summits of the mountains about Julian. Have found them very abundant in ledges and piles of loose rocks. Clothed with long, erect, piceous black hairs.

Stenotrichus rufipes Lec. Moderately common. Varies greatly in size; the male is frequently a mere pigmy, 5.0 mm. in length, while the female may be 8.0 mm. long. Found beneath bark, debris about bushes, etc.

Cibdelis blaschkii Mann. Inhabits the timbered and mountainous districts. Found beneath the bark of trees.

Adelina lecontei Horn. Not common. Sometimes met with in immense numbers under decaying and fungus-covered bark of dead sycamores. A depressed, reddish-ferruginous colored species.

Ulus latus Blais. Rare. Occurs along the San Diego River. Clothed with rather long, moderately slender, recumbent hairs. Elliptical in form and strongly convex.

Ulus crassus Lec. Common. Sometimes exceedingly abundant in March along the San Diego River. Oblong-oval in form, clothed with short, robust, dense hairs.

Blapstinus longulus Lec. Occurs under rocks on the mesas about San Diego. This species has an elongate, parallel, depressed form. The pubescence is short and sparse. The wings are moderately well developed, extending nearly to the apex of the elytra.

Blapstinus dilatatus Lec. Common, but not abundant. Rather evenly distributed. Prefers lowlands and timbered districts. Oblong in form, pubescence rather stout, subrecumbent, moderate in length. The wings are well developed; flight somewhat labored.

Blapstinus rufipes Casey. Common everywhere. Frequently pruinose Pubescence fine, rather long, very inconspicuous. Wings rather rudimentary, about two-thirds as long as the elytra.

Blapstinus brevicollis Lec. Plentiful in the valleys and lowlands near the coast. Oblong-oval and rather depressed in form. Pubescence fine and recumbent, inconspicuous. Wings well developed, longer than the elytra.

Blabstinus coronadensis Blais. Rather common at Coronado, moderately rare elsewhere. Elongate-oblong in form. Pubescence rather conspicuous, somewhat long, recumbent, and pale flavate in color. Wings well developed, about one-third longer than elytra.

Blapstinus pubescens Lec. Moderately common about San Diego Bay on the semi-alkaline flats. Pubescence very conspicuous, moderate in length, recumbent, and ashy in color. Wings well developed and longer than elytra.

Blapstinus sulcatus Lec. Common in the valleys and low lands about San Diego. Pubescence squamiform and robust, subrecumbent. Wings well developed.

Conibius parallelus Lec. Rather common about San Diego and Poway. A small, slender, convex insect, black in color and generally pruinose. Apterous.

Conibius sulcatus Lec. Common. Strongly convex and oblong-oval in form, black in color and generally pruinose. Occurs beneath stones and other material upon the ground.

Tribolium ferrugineum Fab. Rare, occasionally met with beneath bark of trees. A small, moderately depressed, ferruginous species.

Gnathocerus cornutus Fab. Common in ground cereals. Have observed it in all stages of development in "germea" of the stores; usually associated with *Silvanus surinamensis*. The species is elongate-oblong and depressed in form, ferruginous in color.

Aphanotus brevicornus Lec. Rather common in the eastern portion of the county. In this species the eyes are completely divided.

Aphanotus parallelus Casey. Not uncommon in the mountains about Julian Occurs beneath the bark of trees. Eyes not completely divided.

Cynæus depressus Horn. Common at Poway. Lives in the decaying roots of *Yucca whipplei*. Elongate-oval and very depressed in form.

Phaleria rotundata Lec. Exceedingly abundant on the sea-shore beneath kelp. Testaceous in color.

Platydema oregonensis Lec. Occurs in the mountains about Julian, on fungi which grow on old stumps and trees.

Apocrypha anthicoides Esch. Rare. Occasionally taken from beneath rocks or decaying melons; also, from beneath the bark of trees and shrubs. An elongate, wingless species resembling an anthicid.

Apocrypha dyschirioides Lec. Quite rare. Similar in habits to the preceding species.

Helops bachei Lec. Moderately rare. Occurs along the seashore beneath the beach-berry and Œnothera.

Helops blaisdelli Casey. Moderately common in some localities beneath maritime plants growing on the sand dunes along the seashore, near San Diego.

A ROCKY MOUNTAIN BOTANICAL TRAMP.

BY F. D. KELSEY.

On June 27, 1892, a party of eight left Helena, Montana, for a botanical trip to the top of the main range, fifteen miles away. The party consisted of the writer and wife, H. M. and E. N. Brandegee, the wife and daughter of a prominent Helena capitalist, and two young ladies of botanical proclivities. The journey lay along a gulch for several miles where we found in bloom on this date *Ranunculus Cymbalaria, abortivus, sceleratus, affinis and Pennsylvanicus. Delphinium Menziesii* peeped out at us from beneath shrubs, always tempting a botanist to get out and gather each fresh specimen, though he knows he has more than he needs already. Coulter gives its range as "Wyoming, Montana and northwestward." Its deep blue color is charming and attractive and holds well in pressing. In this immediate region it is our only Delphinium.

Along the sides of the gulch now and then could be seen the humble but winsome *Berberis repens*, most of the plants which grow in great profusion being at this season out of bloom. Its yellow roots have considerable reputation for medicinal quality under the erroneous name of Oregon Grape.

Corydalis aurea, modestly hiding its curious blossoms under a bank or a profusion of leaves, nevertheless was eagerly seized by

many hands. Prof. Coulter reports var. *occidentalis* as the more usual one from this region, but Helena must be an exception for ours is the type.

Of mustards met with that day the following may be recorded: *Draba alpina* var. *glacialis*, *Draba nemorosa* var. *hebecarpa*, *Arabis perfoliata*, *spathulata*, *Drummondii* and *Holbœllii*, *Erysimum asperum* and *parviflorum*, *Sisymbrium canescens* and *linifolium*. This *linifolium* is a beautiful plant, glabrous, and every part of it made on the plan of straight lines. Coulter gives it as of very narrow range. It would grow as a luxuriant weed, but has never as yet been troublesome. *Sisymbrium canescens* may well be classed as one of our local, troublesome weeds, and in early spring is much infested by a fungus.

Vesicaria alpina was just going out of bloom, while in cultivated fields *Camelina sativa* is thriving at an alarming rate. It has been introduced through wheat and oat seeds.

Capsella Bursa-pastoris is cosmopolitan and is found all over our state, along roadsides, streets, fence corners and cultivated grounds. *Lepidium intermedium* is native, abundant and something of a weed.

Our most common violets are *Viola canina* varieties *sylvestris* and *adunca*. *V. cuculata* is said to be sparingly reported from the Rocky Mountain region, but it has been gathered at Helena, Deer Lodge, Bozeman, Anaconda, and the Belt Mountains, all in Montana. *V. Canadensis* is plentiful, and also *V. Nuttallii*. Since the date of this expedition the writer has gathered *Viola biflora* at Granite, Montana, at an elevation of eight thousand feet.

Cerastium arvense was abundant and *Stellaria longifolia* and *longipes* were plentiful, while *Arenaria congesta* var. *subcongesta* was just beginning to flower. *Lewisia rediviva*, locally called "Bitter root," was blooming profusely. It is a portulaca, with linear fleshy leaves lying flat on the ground in a perfect circle of 2½ to 3½ inches diameter. These leaves usually have disappeared by the time the bloom appears, so that the flowers seem to lift their rosy colored heads out of the bare, sandy plains. The bloom is wondrously cheery on a bright sunny morning. The roots are thick, covered with a deep red epidermis, and have a slightly bitter taste. When dried and pounded into a meal they make a very nutritious and acceptable diet, formerly much used by our Indians.

The hillsides in many places revealed the home of our wild flax,

Linum Lewisii, which gives promise some day of being of considerable commercial value.

Negundo aceroides grows luxuriantly all over this region and is a favorite tree for front yards in the city of Helena.

Rhus aromatica var. *trilobata* was found growing up little gullies, but had just gone out of bloom.

Thermopsis rhombifolia and *montana* were not found on this trip or region; but the writer knows that they were both in bloom at this time on regions but little remote from the range of the trip.

Lupinus leucophyllus surprised us by showing its blue racemes much earlier than was expected.

Astragalus caryocarpus was found both in bloom and in fruit, its large globular juicy pods giving promise of service as food for man: it is reported from some sections as used for pickles.

Astragalus Canadensis was only in bud; as also *A. adsurgens*, *hypoglottis*, and *Drummondii*.

Astragalus Missouriensis is very common on our plains, and always attracts the botanical eye both for its beauty of bloom and grace of pods. It clings close to the soil in its struggle for existence on our hot waterless plains.

Astragalus Purshii was abundant in fruit, but its bloom had gone. The bloom is very scant, yellow; but the pods are turgid and covered with glossy white long wool, giving them a very strange appearance as they lie flat upon the ground.

Astragalus triphyllus is also to be found on these gulch sides, but at this season out of bloom. One strange experience belongs to the writer, namely: while he has seen this plant by the thousands in bloom, he has never yet gathered it in fruit. Many a time has he bent down to search for its fruit, but thus far in vain.

Astragalus inflexus was seen, but not in bloom. *Astragalus bisulcatus* and *flexuosus* were just beginning to open.

Oxytropis lagopus was in full bloom, as also *O. Lamberti*, our dreaded "loco weed." Besides these the writer knows to be in bloom at this time in other regions of the State *Oxytropis nana*, and nearly ready to bloom *O. deflexa* and *splendens*.

Hedysarum boreale is also in bloom, but our specimens instead of being purple, as says Coulter's description, are invariably creamy white. Later, the writer finds this growing plentifully at an elevation of 8,300 feet.

Prunus demissa greeted our eyes frequently along the stream we were following.

Purshia tridentata was out of bloom until we came to the higher regions, and there we found the leafless bushes one mass of yellow, fragrant bloom; at places the mountain sides seemed golden as they were covered with this luxuriant plant. It is every way worthy of cultivation.

Geum strictum and *triflorum* were frequently found, the latter always attracting attention, both in bloom and fruit. The flowers appear like drooping buds, and the erect plumose fruits are lovely and graceful waving in the sunshine.

Fragaria Virginica var. *Illinoensis* was very abundant on mountain sides and parks.

Of the Potentillas we met *glandulosa*, *Norvegica*, *rivalis* var. *millegrana*, *Pennsylvanica*, *Hippiana*, *gracilis*, and *Anserina*. *Rosa Sayi* and *Arkansana* were in bud, with here and there a bloom.

One good sized tree of *Cratægus Douglasii* was met on the mountain side in gorgeous bloom; mixed with the surrounding pines and fir it seemed like a vase of Nature's own setting.

Amelanchier alnifolia was mostly out of bloom and in fruit.

As we climbed the mountain top we found *Geranium incisum*, and *Richardsoni*, *Acer glabrum*, *Trifolium eriocephalum*, *Rubus strigosus*, and *Astragalus campestris*.

In a bog on the mountain top we gathered fine specimens of *Saxifraga integrifolia*, and *Camassia esculenta*, whose fine bulb is delicious and nutritious, and ought to be experimented upon as giving promise of a new and valuable food product for our markets.

The delicate *Tellima parviflora* was eagerly gathered. *Heuchera cylindrica* and *parvifolia* we found everywhere on the mountain sides.

Philadelphus Lewisii was just making its appearance, and will soon become valuable for export all over the United States as a much prized shrub for lawns and gardens.

The Ribes met with were *R. oxycanthoides*, *lacustre*, *Hudsonianum*, *cereum*, *viscosissimum*, *floridum*, *sanguineum* var. *variegatum* and *aureum*. *Ribes viscosissimum* is a valuable low shrub, very fragrant. Its range is very restricted.

Musenium trachyspermum, *Sium cicutæfolium*, *Osmorrhiza nuda*, and *occidentalis*, *Zizia cordata*, *Pseudocymopterus bipinnatus*, *Peuce-*

danum simplex, and *Leptotænia multifida*, and a Peucedanum not yet identified, were our finds in Umbelliferæ.

Cornus stolonifera was in full bloom along the brooks.

Sambucus melanocarpa was in fine bloom upon the top of the range, and brought vividly to mind my honored friend Prof. E. L. Greene, who by this time I hope has forgiven me for tempting him one August to taste the rich fine black fruit. I took to my heels—he after me. I know of no animal that uses these fine appearing berries. Probably, also, Prof. Greene has discarded their use!

Valeriana sylvatica and *edulis* are just passing into fruit.

Aplopappus acaulis var. *glabratus* was just beginning to bloom, while *Townsendia Parryi* was in its prime and delighted every one whose good fortune it was to gather it. This plant is gorgeous and makes one of the finest of bouquet flowers as well as garden plants. The day is coming when horticulturists will "go wild" over it.

Townsendia sericea has wholly disappeared at this season.

Erigeron macranthus, *glabellus*, *compositus* var. *trifidus* met our gaze. *Antennaria dioica* was abundant, but *dimorpha* had disappeared. *A. Carpathica* was gathered, as also *Anaphalis margaritacea*.

Balsamorrhiza sagittata is exceedingly abundant in this region, but is out of bloom at this season except at high altitudes. *Chænactis Douglasii*, *Actinella acaulis*, *Gaillardia aristata*, *Achillea millefolium*, *Arnica cordifolia* and *alpina* rewarded our search, as also *Senecio canus* and *aureus*.

Microseris troximoides, *Crepis elegans*, *runcinata*, *acuminata* and *occidentalis* were in bloom, as also *Troximon glaucum*.

Taraxacum officinale var. *alpinum* grew sparingly on the top of the range.

Campanula rotundifolia was very abundant, as also *Arctostaphylos Uva-ursi*.

Dodecatheon Meadia in several varieties was found just going out of bloom. *Douglasia montana* was in fruit.

Androsace septentrionalis and *occidentalis* were sparingly found here, though near by they grow profusely. *Glaux maritima* is abundant on our damp plains. A few specimens were found of *Frasera speciosa*, which grows profusely in the mountains west of the main range.

Phlox muscoides, *canescens*, and *Richardsoni*, were all out of

bloom; *longifolia* was just getting beyond its prime. *Gilia spicata* was not found on this trip, although it was in bloom near by.

Phacelia circinata, *Franklinii*, *sericea* and *Menziesii* were all in bloom though not all found by our party on that excursion. *Echinospermum floribundum* and *Redowskii* were in bloom, while *Omphalodes Howardi* was in fruit. *Krynitskia glomerata* was in fine condition. *Mertensia oblongifolia* had passed into fruit, but *Sibirica* was in prime condition. *Lithospermum pilosum* and *angustifolium* had gone to fruit. *Collinsia parviflora* was past its prime. The Pentstemons in bloom were *acuminatus*, *cristatus*, *confertus* var. *cæruleo-purpureus*, and one as yet unidentified. *Synthyris rubra* had gone to seed. *Castilleia mineata* and *pallida* were sparingly found. *Plantago eriopoda* was plentiful on the plains. *Eriogonum umbellatum* was just coming into bloom, and *Shepherdia Canadensis* going out of bloom. *Betula occidentalis*, *Alnus viridis*, *Salix longifolia*, *flavescens*, *rostrata* and *Populus tremuloides* lined the brook sides.

Cypripedium parviflorum, *Iris Missouriensis*, *Sisyrinchium mucronatum*, *Camassia esculenta*, *Smilacina amplexicaulis* and *stellata*, *Fritillaria atropurpurea*, *Erythronium grandiflorum* var. *minor*, *Streptopus amplexifolius*, *Prosartes trachycarpa*, *Zygadenus elegans* were the liliaceous flowers in bloom. *Leucocrinum montanum* and *Fritillaria pudica* had long disappeared.

Of Conifers we met *Juniper communis*, *Pseudotsuga Douglasii*, *Pinus flexilis* var. *albicaulis*, *Pinus ponderosa* var. *scopulorum*, and *Pinus contorta* var. *Murrayana*.

INSECTS FREQUENTING YUCCA BLOOMS.

BY C. H. TYLER TOWNSEND.

Any obsevations, however imperfect, relating to insects found frequenting the flowers of the various species of Yucca, are of much interest and value, in view of the attention which is being given to this subject by Dr. Riley, Prof. Trelease, and others.

It is believed by many persons now, since Dr. Riley first advanced the idea some years ago, that certain species of Pronuba, a genus of of small moths, are more or less indispensable to the fertilization of the Yucca flowers. Moreover, the benefit between the moth and the plant is believed to be mutual, inasmuch as the moth deposits

her eggs in the ovary of the flower and the larvæ bore in the green seed-pod. The moth has been observed to convey the pollen from the anthers to the pistil by a special act, as though impelled by reason or instinct, that the fruit might not fail to be fertilized and thus afford food for her larvæ. Whether, however, no other insects are able to fertilize these flowers is a mooted question. The Pronuba works in the evening only, and thus necessitates the employment of a dark lantern, a stepladder, and a great portion of the night spent on plains or mesas, in order to intelligently investigate its operations. As I have not been so situated that I could spend the proper time in the evenings on this work at the proper season, my observations have been made wholly in the day time. Therefore I have not observed the Pronuba moth at all, but have made, however, a few notes on the larvæ found in the pods as well as on other insects found in the flowers.

In the first place I should say that what is here recorded was observed in the vicinity of Las Cruces, New Mexico; and that our native Yuccas belong, as far as can be at present determined, to two species. We have *Yucca angustifolia;* while the other is a broad-leafed species at first supposed to be *Yucca baccata*, but which may prove to be *Y. macrocarpa*, in case the latter is a valid species. Mr. W. H. Evans, now of the Agricultural Department in Washington, gave me the above information and is now engaged looking up the matter.

COLEOPTERA.

Carpophilus niger Say, a small beetle belonging to the family Nitidulidæ, very plentifully infests the (flower) stalk buds of *Y. macrocarpa* (?) before the stalk has appeared, about the last of March or first of April. They eat holes in the outer covering and inside portions of the large flower stalk, which at first has the appearance of a bud in the center of the plant. They are also found later in the flowers.

Epicauta cinctipennis Chev. (?) Adult blister beetles, very much resembling this Mexican species, were found in the blooms of *Y. macrocarpa* (?) by Prof. Wooton, of the New Mexico Agricultural College, May 15, 1892. Several specimens were collected.

A ryhncophorous (?) larva was found, May 15, 1891, in the tip end of a pod of *Y. macrocarpa* (?) which had been picked May 10. It is a small white larva, apparently coleopterous, nearly 5 mm.

long, very chunky, and was taken from a little cavity in the extreme tip or distal end of the fruit.

LEPIDOPTERA.

Pronuba (?) larvæ. What are undoubtedly larvæ of a species of Pronuba were found May 15, 1891, in pods of *Y. macrocarpa* (?). Four pods, picked May 10, showed two infested. A whitish lepidopterous larva was found eating through the white seeds, usually in the stem or proximal end of the fruit. Three were found in one pod, two being in the same tier of seeds. Out of 21 pods of this Yucca picked May 15, only five were found infested. Some pods contained several larvæ, in one case located near the tip or blossom end. Nine large larvæ, averaging over 10 mm. in length, and two small ones about 5 mm. long, were extracted from these pods (25 pods).

DIPTERA.

A small black acalyptrate muscid, apparently belonging in or near the family Phycodromidæ, is very abundant on the flowers of *Yucca macrocarpa* (?) throughout its blooming period. In fact this fly is about the only insect to be found plentifully in the flowers through the day, so far as I have seen. Specimens were collected April 4, 1891. It is about 3 to 3.5 mm. long (body length), while the wings are 3.5 to 4 mm. long.

Sarcophaga spp. I have also noticed, in April and May, several species of Sarcophaga frequenting the flowers of this Yucca in the day time. They are often quite numerous on and about the flowers, but doubtless have nothing to do with the fertilization of the latter.

BIRD NOTES FROM ALAMEDA COUNTY.

BY F. O. JOHNSON.

WESTERN ROBIN. *Merula migratoria propinqua.* — On the morning of Deccember 6, 1891, while pursuing a Townsend's sparrow which had flown to the top of a tall growth of jasmine, I noticed on the opposite side of the bush a strange bird moping in the shade. It observed me just as I saw it, and hopped sluggishly to another branch putting a bough between us. I thought I was acquainted with all the birds of this region, but this dusky stranger was altogether unknown to me. My first impression was that it might be

a catbird which had strayed from his rightful home. I crept up cautiously for I only had a small 22 calibre cane-gun, and easily approached within twenty feet. It made no note and did not pay the least attention to my maneuvers. When I killed it, I was still more puzzled, for it was totally different from anything I had ever seen. It appeared much like some European thrush.

The prevailing color is a dark hair brown varying to lighter or darker on different regions of the body. The top and sides of head, back, wings, tail and under-tail coverts are a uniform dark hair brown; throat somewhat streaked with ashy after the pattern of our robin, but the black streaks of the common bird are replaced by brown and the white by ashy; jugulum conspicuously washed by dark rusty, abruptly terminating at the belly with faint indications of a black band as in Hesperocichla; feathers of belly broadly edged with ashy; flanks washed with rusty, with short ashy streaks effected by the shafts which are of an ashy color, with often slight margins of the same on each side; bill of same, dark brown color; tarsi and feet also darker.

The bill is less notched than ordinarily in robins. This, together with the peculiar disposition of the rusty wash, at first made me rather chary in referring the bird to Merula, but on closer inspection it seems to be undoubtedly a rare melanistic plumage of our western robin. In taking on this singular phase, it has departed from the disposition of color seen in the ordinary bird as will be seen by the following: The top of head is no darker than the rest of the back; the black and white streaks of the throat of the ordinary bird are replaced by close irregular streakings of dark chocolate over an ashy ground; the rusty wash of the jugulum, instead of following clear down the belly to tail coverts, terminates abruptly at the breast and gives way to an ashy cast which continues to the vent. The under-tail coverts, instead of being the lightest part of the bird's coloration, is as dark as elsewhere, and there is no trace of the white tips on the outer tail feathers. The downy under plumage is also darker than in the common bird.

These singular departures from the general tone of a robin are inexplicable to me, and at first made me doubtful in calling the bird a robin.

Although a few melanistic phases have been recorded of the eastern species, this is, I believe, the first specimen of a melanistic western robin recorded.

CALIFORNIA CREEPER. *Certhia familiaris occidentalis.*—On the 13th of November, 1892, I observed a California creeper in the tall cypress trees at Berkeley, in the grounds of the University. This is the first record of the creeper, I believe, for the county. The grounds are peculiarly adapted for this bird, there being large cypress, eucalyptus, pines and oak trees on the premises. On the following morning, while strolling through the same vicinity, a creeper was shot not over one hundred yards from where I had observed it the day before. It was probably the same bird, for close searching failed to find another and I have not seen once since.

RED-BELLIED NUTHATCH. *Sitta canadensis.*—This nuthatch has generally been regarded as an uncommon visitant of the vicinity of Berkeley and Oakland, yet in November I observed them five or six different times and in the winter months I could find a pair almost any day about the pines of the University. They were nearly always associated in pairs and frequently would maintain for many minutes that monotonous call so peculiar to the nuthatches. The last I heard them was near the first of May.

BLACK-THROATED GRAY WARBLER. *Dendroica nigrescens.*—One bird was seen by me hopping in a cypress tree at Berkeley, abut the 1st of November. I know of no previous record for the county. Though a passing migrant, it appeared perfectly at ease, and in no hurry to leave the spot.

TOWNSEND'S WARBLER. *Dendroica townsendi.*—During last fall I saw four of these rare birds, two of which I secured. On the 24th of November, I secured a male in full plumage. He was lively and uttered a short call-note from time to time. I only wounded him the first time I shot and he made some short quick chirps and another bird flew to the top of the tree and responded. It was probably a female, but as it kept out of range of my little pistol I was unable to secure it. When I shot the male the second time it flew away, and I could not find it again. Out of six I have seen taken in California, this is the only one that is in full adult plumage.

ZONOTRICHIA ALBICOLIS IN CALIFORNIA.

April 22, 1892, I shot a fine male near Stockton, which makes, I believe, the third specimen taken in California. L. BELDING.

NOTES ON SCIURUS FOSSOR Peale.

BY F. STEPHENS.

In southern California the California gray squirrel is found only in the pine region, and principally in the lower part of that region where oaks are interspersed among the pines. My acquaintance with the species in life is confined to San Bernardino and San Diego counties, where I have seen it as low as 4,500 feet altitude and as high as 8,500.

In southern California this squirrel does not hibernate, though probably not coming out of its nest in very stormy weather. It does not appear to store up much food for use in stormy weather, but depends mainly on foraging even in winter. Their homes appear to be hollows in trees all the year through. These are lined with leaves, strips of bark, etc. The nests composed of twigs with the leaves on them, seen in the tree tops, are used for bringing forth and rearing the young, though perhaps used by adults in the heated term. June 23, 1885, I obtained a female and four young from such a nest. The nest was in the summit of a large mountain alder, growing along a stream on the south side of Grayback, the highest peak of the San Bernardino Mountains, at about 8,000 feet altitude. The surrounding forest was principally large yellow pines and evergreen oaks. These young were yet blind and their pelage was so short as to scarcely hide the skin.

The breeding season is rather long. In my notes I find records relating to the breeding of this species as follows: March 25, four females shot, one with three embryos, one with two, one with one and one with none; May 28, a female taken which appeared to have reared young recently; June 23, female and four young taken as mentioned above; July 3, one female taken was suckling young and another contained two small embryos; July 5, female taken contained one half-grown embryo.

As far as these records go they show the number of young to be one to four, with two and three as the usual number. They may be taken as indicating the rearing of young twice a year, but I feel in doubt of this being the case. As I have taken ungrown specimens in spring I think it takes a year at least for individuals to grow to maturity. As the species does no harm to crops and is fair eating it should be protected, at least during the breeding season.

This squirrel varies in abundance in the same locality in succeeding years without apparent cause. Some hunters think it is subject to epidemics, which is probable. Last March I picked up one dead that on skinning showed no wound. It was much congested, so that the veins all over the body were very distinct. It was in fair condition for the season, so its disease was not of long standing

The seasonable variation of this species consists of the addition in winter of an ochraceous or cinnamon-rufous wash over the upper surface, principally over the shoulders, but often extending from the neck to the rump. In some winter specimens this wash is quite strong, but in others it is hardly appreciable. This difference in color is only in the next to the last annulation of the hairs of the upper surface. These annulations in summer are nearly pure white but in winter they become more or less rufous colored. The last, blackish annulation or tip, being short, does not much obscure the color of the lighter band below.

A comparison of specimens from San Bernardino and San Diego counties with specimens from near San Francisco in the collection of the Academy of Sciences shows the southern squirrel to be intermediate between the two forms found near San Francisco. I hardly know whether to refer the southern animal to *Sciurus fossor* or to Mr. Bryant's new sub-species *nigripes*. It may even need separation sub-specifically from both, as it is certainly a little different in color from either. The southern animal is quite constant in color except the presence of the ochraceous wash on the dorsal surface of some in winter.

I have not been able to consult Audubon and Bachman's original description of *Sciurus leporinus*, which has been discredited by most later authors, but from Baird's reference to it I am inclined to think that it was founded on a northern California individual having an unsually strong wash of ochraceous or chestnut on the upper surface, about the color that I should expect to see on winter specimens from, say, Humboldt. It is probable that *leporinus* will ultimately be restored and *fossor* of Peale be placed in the list of synonyms.

SOME OF THE METHODS AND IMPLEMENTS BY WHICH THE PACIFIC COAST INDIANS OBTAINED GAME.

BY L. BELDING.

The bow and arrow was here, as in most parts of the globe, a standard weapon of the natives. The spear was also an important implement of destruction, judging by the numerous carefully made spearheads which are so widely distributed in and on the soil.

Perhaps next to these in importance, in California at least, were the sling, or throwing stones. This is mere conjecture, for, while the grooved and perforated stones of this State are well known to ethnologists, but little is known concerning them. As they are so often turned up by the plow, they were probably in use at no distant day. The Mexicans who first came to California must have had good opportunity to learn the use of these stones—much better than the Americans who came later. They were probably extensively used in killing ducks and geese. Some partially flattened, bevelled, and pointed, grooved stones, which are found in Butte County, appear to indicate that two or more were tied to a common center and thrown together just as they were thrown in Alaska, as described by Mr. Turner. Other forms were probably thrown singly. In the large tule marshes where water fowl must have been swarming, as is still the case a portion of the year, and in other stoneless tracts, the hunter must recover the stone or his occupation would soon be gone. It would be almost impossible to recover it if it fell in the dense tule thickets or ponds unless a string was attached to it. It may have been a long string, one end of which was held in the hand. A short string might answer the purpose if some prominent object was fastened to it—a white quill for example.

Geese and ducks were, no doubt, much tamer before guns were introduced here, but even now, on Butte Creek, when millions of geese first arrive in the fall, a thrower of average skill could kill geese in the manner I have suggested.

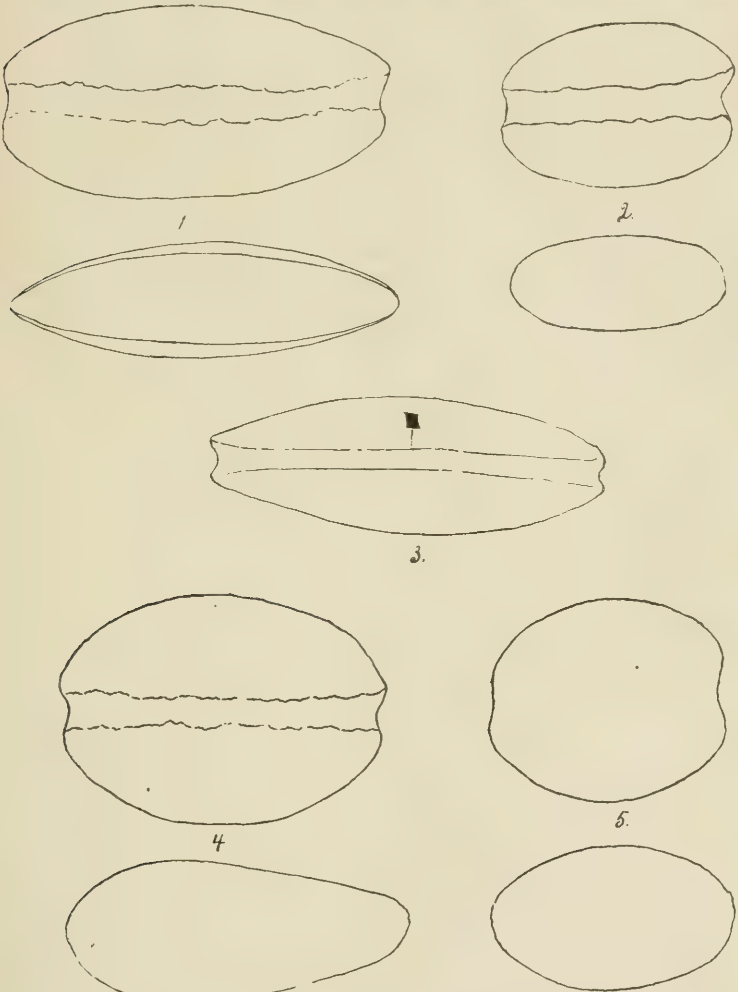
The accompanying figures represent the throwing stones above referred to:

Figure 1. Length 90 mm.; breadth 45 mm.; thickness 25 mm.

Figure 2. Length 52 mm.; breadth 42 mm.; thickness 28 mm.

Figure 3. Length 95 mm.; diameter 32 mm. This may have been used a pendent or charm.

Figure 4. Length 77 mm.; breadth 51 mm.; thickness 30 mm.
Figure 5. Length 55 mm.; breadth 49 mm.; thickness 40 mm.



Dr. Heermann, who was in California soon after the discovery of gold, says Lieutenant Stoneman, of the United States Army, told him that he had seen "Californians" catch geese in a lasso, as they flew low against a strong wind, and that he, Heermann, had known

a "native" to procure seventeen geese in a single charge, on horse back, through a flock of several acres, by riding near the flock and suddenly putting spurs to his horse and striking the geese with a club. The wielders of the lasso and club were probably Mexicans but the manner of killing the geese deserves mention here

Lieutenant Birnie, in Geographical Surveys west of the One Hundreth Meridian, describes peculiar blinds that the Indians near Death Valley made, just by springs and artificial ponds, for the purpose of killing quail and other birds. The blinds had the general appearance of beehives; were made of rushes and small boughs interlaced, with an opening for entrance on the side away from the spring. The inside was large enough to seat one person. There was a small hole on the side toward the water through which the arrow was shot. A string was attached to the arrow, and repeated shots could be made with it without alarming the game.

The Indians of Calaveras County catch mountain quail (Oreortyx) with snares of hair and twine. They make brush fences, about two feet high and from a fourth to half a mile long, leading obliquely from a creek or cañon, over a hill that is covered with a dwarfed growth of chaparral. Holes large enough for a quail to pass through are left in the fence, and in these holes the snare is placed. The birds are driven toward and along the fence, care being taken not to press them too hard. The birds are taken from the snares a little later and are usually uninjured by the snare, the loop of which is intended to catch the quail around the body in front of the wings.

I suppose these Indians sometimes caught deer in snares, having once, while following a deer-path through a thicket of small pines, found a rope-snare fastened to the top of a bent sapling and so set as to endanger any deer that might pass along the path

The Pit River Indians caught game by digging pits about six feet deep and covering them with twigs and grass. This custom gave the name to the river and tribe.

Mr. Ridgway, in Ornithology of the Fortieth Parallel, says the Indians of the Great Basin [in Nevada] made elaborate decoys of canvas-back and red-head ducks, the skins stretched over bodies of dried tules, the heads prepared and poised in a style equal to that of the most accomplished taxidermist. The floating decoy was fastened by a stone tied to a string, the other end of which was fastened to the bill.

California Indians, according to Dr. Heermann, entrapped mallards and other ducks in a weir made of willow branches, and also shot ducks with arrows from ambushes built on the shore.

Dr. Suckley, in Natural History of Washington Territory, about the year 1860, says the Indians living along the Straits of Fuca destroyed vast numbers of wild ducks by shooting with shot, and when short of ammunition with arrows; that they obtained ducks in great quantities by stretching long nets on a line suspended on poles which were about as far apart, and looked much like telegraph poles. The poles were erected on the long sand spits running out from points and dividing bays along the straits. The nets were stretched at nightfall, directly in the course of the flight of the birds as they flew from bay to bay, and from point to point. He adds that the Lummi and Skadgett Indians obtained ducks at night by fire—hunting with canoes and lights. The ducks dazzled and bewitched by the light would allow it to approach so near that they were killed with arrows and spears. It was not unusual to take a good sized canoe load in this manner in a single night.

Lucien M. Turner, in Arctic Series of Publications of the United States Signal Service, says before the natives of Alaska had guns they usually caught geese in nets, which were about three feet high and thirty feet long, on the margin of a pond. When the geese were near enough the net was thrown over them by a man who was secreted near the net. Another method was to use three rounded stones of nearly equal weight and size, generally about one and one-half inches in diameter, though they differed with each individual's strength, the women also using lighter stones than those used by the men. A groove was cut around each stone and deepened sufficiently to hold a strong thong of seal skin about twelve inches long. The three loose ends of the strings were tied together, placed in the palm of the hand, and the stones that were attached to the other ends of the strings were carefully disposed on the coiled thongs in the hand. A flock of geese that came near enough would have this "bolas" thrown at them and it was "certain to become entangled on the neck or wings of some goose which fell to the earth and was immediately secured. The women were adepts at throwing these stones. An old woman told me that she had often got two, and, occasionally, three geese at a single throw."

E. W. Nelson, in the same series, says "the wolf is trapped by

the Eskimo in a peculiar manner, which is also practised by the Eskimo north of Hudson's Bay. A piece of whalebone about eight inches long, and of the size of a flattened lead pencil sharpened at both ends, is soaked in water until it is thoroughly softened. It is then bent on itself in folds about an inch long, and is tied in this position until it is thoroughly dry. The cord is then removed and the coil retains its position. It is then covered about an inch thick with tallow and laid out for the wolf to find. The latter picks up the morsel of fat containing the whalebone, and not being able to chew it, gulps it down entire. In a short time the juices and warmth of the animal's stomach act upon the whalebone and it slowly straightens out and the sharp points transfix the stomach, and if they do not enter the heart and lungs and produce death at once they cause the animal such agony that he lies down and becomes an easy prey for the hunter who follows his trail."

There is an Alaskan bird sling in the Academy collection which is quite similar to a form described by Wood, Knight, and others. It consists of ten small pieces of ivory, each of which is pierced and fastened by a string about thirty inches long. On the other end of each string is a slender quill five or six inches long, and all of the quills are bound together with sennet.

The above, though it does not exhaust the subject, proves that the Indians of this coast were very ingenious in capturing birds and animals, and some of them were equally ingenious in catching fish. The Washoe Indians are very successful is spearing trout when the fish run up stream to spawn. They build huts of boughs over brooks, the fisherman being able to see the fish just below him from the dark interior of the hut, while the fish cannot see the fisherman. About forty years ago, when the writer was in Bering Straits and the Arctic Ocean, the favorite recently adopted harpoon of American whalemen—the so called toggle iron—was modelled after an Eskimo bone harpoon used by the natives about the Straits.

The white water lily mentioned in the Botany of California as occurring about the head-waters of Eel River has been definitely located by Mrs. E. C. Campbell, who obtained roots from a Mr. Crabtree, living a few miles from Bartlett Springs. No flowering specimens have yet been seen by botanists.

MARIPOSA COUNTY AS A BOTANICAL DISTRICT.

III.

BY J. W. CONGDON.

Before proceeding to discuss the plants of the coniferous belt, I take this opportunity to make some corrections in my former lists.

Since they were prepared, it has been my good fortune to visit San Francisco and enjoy the opportunity there to study, as well as I could in the brief time which other engagements permitted, the large collections of the Academy of Sciences, principally, with reference to the correction of errors in my determinations of our many difficult species.

In making this examination I was indebted to Mrs. Katherine Brandegee, curator of the herbarium, for valuable suggestions and assistance, which it gives me great pleasure to acknowledge.

These corrections, as will be seen, consist partly in correcting mistakes in identifying the plants themselves, and partly in making the nomenclature adopted conform to the latest and best authorities. This applies principally to the Umbelliferæ. *Podosciadium Californicum* Gray of Bot. Cal. is *Eulophus Californicus* C. & R. of Coulter and Rose's Revision of the Umbelliferæ. *Ferula dissoluta* Wats. is *Leptotænia dissecta* Nutt. *Deweya Hartwegi* Gray is *Velæa Hartwegi* C. & R. *Stephanomeria paniculata* Nutt. should be *S. virgata* Nutt.

The plant referred to as *Phacelia phyllomanica* Gray is *P. platyloba* Gray, and is also clearly the plant described by Mr. Greene under the name of *P. Arthuri*. Mr. Greene's character is taken from a single plant, evidently a waif from the foothill region, where the species is not rare.

Mimulus nanus Hook. & Arn. of the list is clearly a mixture of two and probably three species. The Mariposa plant is *Mimulus subsecundus* Gray, mingled with an apparently undescribed species of the same general habit.

In the coniferous belt, the place of these species is taken by another which, judging from careful observations made since my return, is probably the original *Mimulus nanus* of Gray, but whether Gray's plant or the present agrees with the *nanus* of Hooker and Arnott I have no means of determining.

Mimulus Pulsiferæ Gray of the list is *M. floribundus* Dougl., and the plant so designated in the list is yet undetermined.

Fritillaria atropurpurea Nutt. should be *F. parviflora* Torr.

THE CONIFEROUS BELT.

As we go eastward from Mariposa we gradually ascend, and at a distance of about ten miles we meet the western or lower edge of this zone. The line of demarkation here is quite plain and is indicated by the commencement of the continuous pine forest, and also by the appearance of the so-called bear clover *(Chamæbatia foliolosa)*. This plant begins with the pine forest at about 3,000 feet, and forms a nearly continuous elastic mat about a foot deep under the trees, extending nearly or quite to the upper line of this zone, at about 6,000 feet. This upper boundary is not as clearly marked as the lower one, but is here understood to coincide with the line which bounds the territory inhabitable throughout the year. Above 6,000 feet the country, though beautiful and furnishing the most delightful and healthful summer residence in California, is usually covered in the winter with snow to a depth which practically makes a winter residence impossible, and hence excludes any permanent population. The subalpine zone, as here indicated, consists principally of certain high plateaux hereinafter described lying between the principal mountain ridges and of the great intervening valleys formed by the rivers, while all that portion of the heavily wooded zone which lies below is included in the Coniferous belt.

The forest, which, originally at least, covered substantially the whole of this belt and still covers by far the greater portion of it, consists principally of yellow pine *(Pinus ponderosa)*, but the cedar *(Libocedrus decurrens)* is everywhere common, without occupying any tract exclusively. At about 4,000 feet, the white spruce *(Abies concolor)* and the Douglas spruce *(Pseudotsuga Douglasii)* begin to be frequent along the streams, while the sugar pine *(Pinus Lambertiana)* becomes abundant on the upper slopes.

The magnificent size and the perfection of growth which all these trees here attain are not surpassed in California. Oregon, even, can hardly show more noble specimens or more valuable tracts of timber.

The deciduous trees in this zone are not usually conspicuous either for number or size, but the golden cup oak *(Quercus chryso-*

lepis) is often a marked exception. Single trees of this species are often found which, in size of trunk, in wide expanse and symmetry of growth, vie with the noblest oaks of the coast, while, in the beauty of the foliage and of their golden-velvety fruit, they surpass all our other species. The golden cup of the coast, indeed, is commonly but a scraggly, ungainly tree compared with the same species in our coniferous belt. The black oak *(Quercus Kelloggii)* is frequent in the woods, while along the streams the flowering dogwood *(Cornus Nuttallii)*, the alder *(Alnus rhombifolia)* and a few willows represent nearly the whole of our deciduous trees in this belt.

In the following list of species, in addition to the letters and marks previously used, Ct. indicates that the plant is also found on the coast, while Y shows that the plant is a portion of the peculiar flora of the Yosemite Valley:

Ranunculus hystriculus Gray. Wet cliffs, Merced River, Devil's Gulch, etc. Y.
Actæa spicata L. var. arguta Torr. Scarce. Ct.
Dicentra formosa DC. Rocky beds of streams. S. Ct.
Dentaria tenella Pursh. Frequent.
Streptanthus tortuosus Kell. Rocky hills. S.
Viola lobata Benth. Frequent above 4,500 feet. S.
Silene Lemmoni Wats. Occasional above 4,500 feet. S.
incompta Gray. Common. S.
Bridgesii Rohrbach. Mostly above 5,000 feet. Perhaps identical with the last. S. Y.
Sagina Linnæi Presl. Banks of streams. Occasional above 4,500 feet. S. A.
Claytonia linearis Dougl. Darrah. Local.
Limnanthes Douglasii R. Br. Wet rocks. C. S.
Ceanothus integerrimus. H. & A. Frequent.
decumbens Wats. Frequent above 4,500 feet. S.
Staphylea Bolanderi Gray. Snow Creek, Devil's Gulch, etc.
Lupinus albicaulis Dougl. vars. Various peculiar forms credited to this polymorphus species are abundant and also subalpine.
Lupinus Grayi Wats. A beautiful species frequent below 4,500 feet.
Trifolium Breweri Wats. Occasional in the woods, forming mats, more abundant above. S.

Hosackia crassifolia Benth. Occasional on clayey slopes. S.
  decumbens Benth, var. (?) Nevadensis Wats. Occasional in open clayey soils. More common above. S.
Lathyrus paluster L. var. myrtifolius Gray. Frequent on hillsides below 4,500 feet.
  Nevadensis Wats. Frequent below 5,000 feet.
Prunus emarginata Walp. Scarce below 4,500 feet, frequent above. S. Ct.
Rubus leucodermis Dougl. Frequent below 4,500 feet. Ct.
Saxifraga peltata Torr. Rocky beds of streams, Devil's Gulch, &c. Frequent above. S.
Ribes sanguineum Pursh. Stream banks. S. Y. Ct.
  Menziesii Pursh var. subvestitum. Perhaps new species. Footman Mt. and south in the Sierras above 4,000 feet.
Sedum obtusatum Gray. Rocks. Frequent. S.
  radiatum Wats. Rocky hillsides above 4,000 feet. S. Y.
Cotyledon Nevadensis Torr. Cliffs, Devil's Gulch, Hite's Cove. S.
Gayophytum ramosissimum T. & G. Moist grounds. S.
  diffusum T. & G. Dry slopes. S.
Clarkia rhomboidea Dougl. Frequent in woods below 4,500 feet.
Circæa Pacifica A. & M. Wet places below 4,500.
Selinum capitellatum Benth & Hook. Banks of streams. S.
Cornus Nuttallii Audubon. Frequent above 4,000 feet. S. Ct.
  pubescens Nutt. Stream banks, mostly above 4,000 feet. S.
Symphoricarpus mollis Nutt. Frequent above 4,000 feet. S.
Galium trifidum L. Scarce in wet grounds. S. Ct.
  asperrimum Gray var. ? asperulum Wats. Wet thickets. Frequent. S.
Bigelovia graveolens Gray. Occasional, especially above. S.
Sericocarpus rigidus Lindl. Banks of streams below 5,000 feet.
Aster radulinus Gray. Occasional below 4,500 feet. Ct.
Erigeron Breweri Gray. Rocky places above 4,000 feet. S.
Adenocaulon bicolor Hook. Deep shade below 5,000 feet. Ct.
Antennaria luzuloides T & G. Dry slopes above 4,000 feet. S.
Balsamorhiza Hookeri Nutt. Darrah. Local. Ct.
  deltoidea Nutt. Frequent below 4,500 feet.
Wyethia ovata Gray. Open grounds, frequent below 4,000 feet.
Cnicus Andersonii Gray. Frequent. S.
Microseris nutans Gray. Frequent above 4,000 feet. S.

Malacothrix obtusa Benth. Occasional among rocks in clayey soils (also at Benton Mills).

Campanula prenanthoides Durand. Dry slopes, frequent above 4,000 feet. S. Ct.

Rhododendron occidentale Gray. Banks of streams. Frequent. Ct.

Pyrola picta Sm. Frequent above 4,000 feet. S.

aphylla Sm. With the last. S. Ct.

Pterospora andromedea Nutt. Not rare above 4,000 feet. S.

Apocynum androsæmifolium L. Common below 4,000 feet.

Phlox speciosa Pursh. Bondurant Mine. Local.

Gilia grandiflora. Frequent below 4,000 feet.

linearis. Scarce. S.

heterophylla. Common below 4,500 feet.

leptalea. Common above 4,000 feet. S.

divaricata Gray. Common below 4,500 feet.

ciliata Benth. Frequent. (This has now been found in the Mariposa district.)

Hydrophyllum occidentale Gray. Not rare above 4,500 feet. S.

Draperia systyla Torr. Common above 4,000 feet. S.

Cynoglossum occidentale Gray. Not rare above 4,500 feet. S.

Solanum Xanti Gray. Occasional below 4,500 feet.

Collinsia bartsiæfolia Benth. Below 4,500 feet. Common. Ct.

Species apparently undescribed. Above 4,000 feet. Snow Creek, Yosemite Turnpike. S.

Mimulus atropurpureus Kell. (Kelloggii Curran). Occasional below 5,000 feet.

angustatus Greene. Open grounds. White & Hatch's and above. S. Ct.

bicolor Benth. Open grounds below 4,000 feet. Common.

filicaulis Wats. Snow Creek. Once found.

moschatus Dougl. Wet places, frequent. S.

Veronica Americana Schwein. Wet grounds. Not rare. S.

Castilleia miniata Dougl. Frequent above 4,000 feet. S.

Audibertia humilis Benth. Devil's Gulch at 4,000 feet. Local.

Lophanthus urticifolius Benth. Banks of streams below 4,000 feet. Ct.

Polygonum imbricatum Nutt. Wet places, more common above. S.

Salix Lemmoni Bebb. Scarce in this zone, becomes frequent above. S.

flavescens Nutt. Sweetwater, 5,000 feet and above. S.

Quercus Breweri Engelm. Scarce in the chaparral below 5,000 feet. S.

Quercus dumosa Nutt. Devil's Gulch and above. S. Ct.

Corylus rostrata Ait. Frequent at 4,000 feet.

Asarum Lemmoni Wats. Snow Creek, 3,500 feet.

Comandra umbellata Nutt. Frequent in clayey soils up to 6,000 feet and above. S.

Torreya Californica Torr. Occasional. S. Ct.

Libocedrus decurrens Torr. S.

Abies concolor Lindl. S.

Pseudotsuga Douglasii Carr. S.

Pinus Lambertiana Dougl. S.

tuberculata Gordon. Occasional south of the Merced River, abundant north of it, always near the lower limit of this zone.

Corallorhiza Bigelovii Wats. Above 4,500 feet, frequent in the zone above. S.

Habenaria Unalaschcensis Wats. Common above 5,000 feet, occasional below. S.

Spiranthes Romanzoffiana Cham. Wet places, occasional. S. Ct.

Cephalanthera Oregana Reich. f. Occasional at 4,500 feet and above. S.

Iris Hartwegi Baker. Frequent. S.

Brodiæa multiflora Benth. Frequent below 4,000 feet.

Smilacina amplexicaulis Nutt. Frequent below 4,500 feet.

sessilifolia Nutt. Occasional especially above. S.

Lilium Washingtonianum Kell. Dry slopes, most abundant above 5,000 feet. S.

Calochortus nudus Wats. Frequent at 4,500 feet and above. S.

Prosartes trachyandra Torr. Occasional at about 4,500 feet.

Juncus dubius Engelm. Wet places, more abundant above. S.

Eleocharis Bolanderi Gray. Occasional in wet grounds. S.

Carex Geyeri Boott. Dry ground. Common above 4,500 feet. S.

bromoides Schk. Wet places at about 4,500 feet.

siccata Dew. Occasional below 4,000 feet.

Danthonia Californica Bolander. Most common above 4,000 feet. S. Ct.

Trisetum canescens Buckl. Frequent below 4,500 feet. Ct.
Aira elongata Hook. Same range as last. S. Ct.
Melica bromoides Gray. Rocky places below 4,000 feet. Devil's Gulch.
  Harfordi Bolander. Common. S.
  aristata Thurb. Frequent, especially above 4,000 feet. S.
Poa serotina Ehrh. Darrah. Local.
Festuca ovina L. var. duriuscula. Rocky stream beds at 4,500 feet and above. S.
Ceratochloa breviaristata Hook. Frequent. S.
Adiantum pedatum L. Wet rocks. S.
Cheilanthes gracillima Eaton. Rocks. Hite's Cove and above. Y. S.
  myriophylla Desv. Devil's Gulch, 3,500 feet and above. S.
Asplenium Filix-fœmina Bernhardi. Occasional. S. Ct.

Out of the 122 species enumerated above 75 or more than half extend into the subalpine region, while 24 are also found on the coast without appearing, as far as known, in the intervening territory. It is worth while to notice that of these 24 species 12 are limited to the redwood district which corresponds very closely with our coniferous belt and most of the others are probably stragglers from the same region.

Adding to these 122 species the 152 native and 40 introduced species which appear in the first list as also belonging to the coast region and the 44 native and 2 naturalized species which begin in the lower zone and extend into this, we have 360 as the number of known species belonging to the coniferous zone. The almost continuous pine forest, which, originally at least, covered the whole of this district, is no doubt the cause of the smaller number of species found here, by preventing that variety of condition and situation which is requisite for producing a great variety of vegetation. Out of the 317 native species found here 23, nearly 8 per cent., are so far as known limited to this zone.

DISCOVERY OF A NEW GROVE OF SEQUOIA GIGANTEA.

BY WILLIAM W. PRICE.

Read before the California Academy of Sciences, August 1, 1892.

While stopping with Mr. C. F. Hoffman, Superintendent of the Red Point Mine on the Forest Hill divide, in Placer county, I heard rumors of a grove of big trees situated somewhere on the Middle Fork of the American River. I could find no one who had seen the trees, and I heard various accounts concerning them. Some said they were cedars, and others said they were something new, never before seen.

On June 20, in company with Mr. Karl Hoffman, I set out in search of the supposed grove. Our trail led over the mountains, across the Middle Fork of the American River, to the old, almost deserted mining camp of "Last Chance." Here, after some delay, we found a young miner, Mr. Ferguson, to guide us to the grove. He had been there some five years before, and knew all the country.

The grove was said to lie about eight miles from "Last Chance," and we found it fully that distance. Our trail, for the most part, lay along heavily wooded ridges, where only occasionally we had glimpses of the outside country. Away to the southeast rose the snowy slopes of Mt. Tallac, bordering Lake Tahoe. The trees, for the most part, were sugar pines—lordly fellows—and during the whole eight miles we saw only one cut tree. The miner and the "shake-hunter" had never despoiled this forest. Only a few chipmunks, jays and chickadees were heard to break the grand monotony of forest solitude.

On a slight rise of ground in the forest our guide left us and proceeded on alone. He came back in a short time with the welcome news that he had found the grove. We followed him some distance down the slope over a rich carpet of pine needles, until he came to a cañon—not a very steep one—cut into the slate formation. Then we came upon the grove, the most northern known, I believe, of *Sequoia gigantea*.

Only six trees are standing, and these do not spread over an acre or two of ground. This is, perhaps, the last stand made by *Sequoia gigantea*, and for a thousand years or more this grove has beaten back the fierce onslaughts of fire, storm and cold.

The two largest standing trees are about twelve feet in diameter, the four others are smaller. One fallen tree is twenty feet in diameter at the base, and twelve feet at fifteen feet from the roots. There are other small fallen trees. There had been, years before, a much larger fallen trunk—some said twenty-eight feet in diameter—but a fire had destroyed it. The height is not great, for sugar pines standing near tower above them.

This grove is situated in Placer county, about fifteen miles east of Forest Hill, on one of the streams flowing into the Middle Fork of American River. The altitude is about 5,000 feet.

The country is without any traveled trails, and all about the grove we saw tracks of California lions, bear, deer and other animals. The grove cannot be seen until a person is within a hundred yards, for the heavy-wooded cañon sides close all about it. This, perhaps, accounts for its being so long unknown to scientists. But to the old prospectors it has long been known, for on the bark of alders growing along the creek are cut the dates of 1860, 1862, 1868, 1872, 1880, 1892, and others. I had only an hour to observe the surroundings and take measurements, so this account is very meager. I hope soon to make a more thorough examination of the "North Grove."

TUBA.

BY EDWARD PALMER.

Tuba, a beverage which is very popular in the State of Colima, Mexico, is obtained from the cocoa palm by the following process.

The fruit-bearing stems at the time the flowers are forming have their tips cut off and a gourd—sometimes two or three—hung from each, so as to catch the sap which flows freely from the wounded ends. Twice daily the liquid is collected from the gourds, a very thin slice of the stem being removed at each visit, in order to maintain the flow of sap which would otherwise soon cease from the drying of the exposed surface.

These gourds are often a source of curiosity to travelers, who wonder not only of what use they are, but how the owner gets them there. The height and slenderness of the trees prevent the use of a ladder, and the natives reach the tops by means of notches cut in

the trunk at convenient distances for stepping. By means of these and daily practice they ascend these trees almost with the ease and agility of monkeys.

The gourds are emptied by means of a short reed tube inserted just below the rim into a large flattened one fastened around the body of the climber by a strap. This gourd though very large is well adapted by its flattened shape for being carried about through the foliage of the tree. If insects or any foreign substance has accumulated in the gourds suspended in the trees they are cleaned out by means of a brush made of the interior fibrous wood of the tree which is carried in the belt for that purpose.

The knife used for freshening the ends of the shoots is much like the one used by shoemakers for trimming leather. It is sharpened on a piece of wood shaped like a whetstone with a handle. On the flat, smooth surface of this piece of wood sand is strewn and the blade being dexterously drawn a few times over its surface is sufficiently sharpened for the purpose. The flowering ends yield tuba twice daily for a year.

Tuba in the fresh state much resembles the liquid from the Agave before it becomes pulque. It is very refreshing and nutritious and has a slight taste of cocoanut, but in six hours fermentation sets in, in twelve hours it is as strong as old cider, by twenty-four hours acetic fermentation begins.

In order not to lose tuba when fermentation is far advanced many different things are added to it, and different flavors thereby given.

Some persons drink it when as strong as whisky, while others will mix the fermented juice with fresh so as to modify its strength and render it salable and to many, very palatable, but the form which commands the admiration of those who like to be under the influence of strong drink is known as

TUBA COMPOSTURA.

This is made by adding to the fermented tuba one or more of the following articles: pineapples, lemons or onions in slices, bruised pods of chile or sticks of cinnamon; these being allowed to remain in the tuba for a short time add their flavor and strength to the mixture.

A favorite drink with many is made by adding cinnamon and ground almonds to the old tuba.

These composition drinks are sold at double the price of the fresh tuba, but though much used and highly intoxicating delirium tremens is of rare occurrence.

The venders of tuba or "Tuberos" as they are called, are found in the markets and in certain other places about the streets of Colima drawing thirsty crowds who seem to have preference for the tuba offered for sale by this or that person. The cry of the tubero as he goes about the streets is a familiar one often eagerly responded to. He is an object of curiosity to strangers, wearing a yoke upon his shoulders with a rope depending from each end sustaining by hooks, large gourds filled with tuba. Immediately below the rim of these gourds pieces of reed are inserted. These serve as spouts for pouring the tuba and also to carry the small vessels made of halves of gourds of different sizes, in which the tuba is retailed. These small vessels are pierced and a string passed through, by which they are suspended from the spout when not in use. There is also carried hanging from the spout a strainer which looks like a large wooden spoon full of holes, this is to remove any foreign substance which may appear on the surface of the tuba as the vender wanders to and fro offering to his customers the smallest gourd full of the drink for a cent and the largest one for two cents.

A CHECK-LIST OF THE WATER BIRDS OF CALIFORNIA.

BY WALTER E. BRYANT.

While engaged upon some writing pertaining to the birds of California, I have found it convenient to have a list of the known species readily accessible, and have found Mr. Belding's "Land Birds of the Pacific District" so necessary that I was obliged to prepare a list of the water birds to supplement it. In this connection I have consulted all available records, and have received information regarding several species from Mr. Belding and Dr. J. G. Cooper. I have also compared it with a list compiled by Mr. Palmer two years ago. The publication of the "Water Birds of the Pacific District" having been deferred for lack of fuller information regarding the distribution of species and the times of their arrival and departure, it is hoped that those having the opportunity will give closer attention to the water birds, and make known their observations. I

should be pleased to learn of any authentic additions to this list. The species about whose occurrence and distribution in California less is known have been indicated by a (*). In regard to the geese which occur in this State, see Mr. Belding's article in the present number.

There is no record of the occurrence of the tropic bird *(Phaëthon æthereus)* beyond the doubtful one of a skull having been found on the coast of Marin County more than twenty years ago. Mr. Anthony has noted the species near Cape Colnett, and northward, probably.

1. Æchmophorus occidentalis (Lawr.)
2. Colymbus holbœllii (Reinh.)
3. Colymbus auritus Linn.
4. Colymbus nigricollis californicus (Heerm.)
5. Podilymbus podiceps (Linn.)
6. Urinator imber (Gunn.)
7. Urinator pacificus (Lawr.)
8. Urinator lumme (Gunn.)
9. Lunda cirrhata Pall.
10. Cerorhinca monocerata (Pall.)
11. Ptychoramphus aleuticus (Pall.)
12. Brachyramphus marmoratus (Gmel.)

*13. Brachyramphus hypoleucus Xantus.

14. Cepphus columba Pall.
15. Uria troile californica (Bryant).

*16. Uria lomvia arra (Pall.) A single individual of Pallas's murre has been recorded from San Francisco Bay, in winter, by Dr. Cooper. Proc. Cal. Acad. Sci. v, p. 414.

*17. Stercorarius pomerinus (Temm.) (Bryant, Proc. Cal. Acad. Sci. 2d Ser. ii, 87.)

*18. Stercorarius parasiticus (Linn.)

*19. Rissa tridactyla pollicaris Ridgw.

20. Larus glaucescens Naum.
21. Larus occidentalis Aud.

*22. Larus argentatus smithsonianus Coues.

*23. Larus cachinnans Pall.

24. Larus californicus Lawr.
25. Larus delawarensis Ord.
26. Larus brachyrhynchus Rich.

27. LARUS HEERMANNI Cass.
28. LARUS PHILADELPHIA (Ord.)
29. STERNA TSCHEGRAVA Lepech.
30. STERNA MAXIMA Bodd.
*31. STERNA ELEGANS Gamb.
32. STERNA FORSTERI Nutt.
*33. STERNA PARADISÆA Brünn.
*34. STERNA ANTILLARUM (Less.)
35. HYDROCHELIDON NIGRA SURINAMENSIS (Gmel.)
36. DIOMEDIA NIGRIPES Aud.
37. DIOMEDIA ALBATRUS Pall.
*38. DIOMEDIA MELANOPHRYS Boie. Hab. "Southern seas, especially South Pacific; casual off coast of California." Ridgway.
*39. THALASSOGERON CULMINATUS (Gould).
*40. PHŒBETRIA FULIGINOSA (Gm.) No authentic record for this State, but said to extend "north (casually?) to coast of Oregon." Ridgway.
*41. OSSIFRAGA GIGANTEA (Gm.) Same remarks as above.
*42. FULMARUS GLACIALIS GLUPISCHA Stejn.
*43. FULMARUS GLACIALOIDES (Smith).
*44. PUFFINUS CREATOPUS Coues.
*45. PUFFINUS GAVIA (Forst.) One record from Santa Cruz. Proc. Cal. Acad. 2d Ser. ii, 87.
*46. PUFFINUS GRISEUS (Gmel.) One record from San Francisco. Proc. Cal. Acad. 2d Ser. ii, 87.
*47. PUFFINUS CINEREUS (Gmel.) "Accidental off the coast of California." A. O. U.
*48. DAPTION CAPENSIS (Linn.) "Accidental on coast of California." A. O. U.
*49. OCEANODROMA FURCATA (Gmel.) (Palmer, Proc. Cal. Acad. 2d Ser. ii, 88.)
50. OCEANODROMA HOMOCHROA (Coues).
*51. PHALACROCORAX DILOPHUS CINCINATUS (Brandt).
52. PHALACROCORAX DILOPHUS ALBOCILIATUS Ridgw.
53. PHALACROCORAX PENICILLATUS (Brandt).
*54. PHALACROCORAX PELAGICUS ROBUSTUS Ridgw. (Sutter County. Belding.)
55. PHALACROCORAX PELAGICUS RESPLENDENS (Aud.)

56. Pelecanus erythrorhynchos Gmel.
57. Pelecanus californicus Ridgw.
*58. Fregata aquila (Linn.)
*59. Merganser americanus (Cass.)
60. Merganser serrator (Linn.)
61. Lophodytes cucullatus (Linn.)
62. Anas boschas Linn.
63. Anas strepera Linn.
*64. Anas penelope Linn. (Forest and Stream, xxvi, 426. Auk, iii, 4, 490.)
65. Anas americana Gmel.
66. Anas carolinensis Gmel.
*67. Anas discors Linn. Only five specimens are known to have been taken in California. Zoe, ii, 2, 97 and 128.
68. Anas cyanoptera Vieill.
69. Spatula clypeata (Linn.)
70. Dafila acuta (Linn.)
71. Aix sponsa (Linn.)
72. Aythya americana (Eyt.)
73. Aythya vallisneria (Wils.)
74. Aythya marila nearctica Stejn.
75. Aythya affinis (Eyt.)
76. Aythya collaris (Donov.)
77. Glaucionetta clangula americana (Bonap.)
78. Glaucionetta islandica (Gmel.)
79. Charitonetta albeola (Linn.)
*80. Clangula hyemalis (Linn.)
*81. Histrionicus histrionicus (Linn.)
*82. Somateria spectabilis (Linn.)
83. Oidemia americana Sw. & Rich.
84. Oidemia deglandi Bonap.
85. Oidemia perspicillata (Linn.)
86. Erismatura rubida (Wils.)
87. Chen hyperborea (Pall.)
*88. Chen rossii (Baird).
89. Chen cærulescens (Linn.)
90. Anser albifrons gambeli (Hartl.)
91. Branta canadensis hutchinsii (Sw. & Rich.)
92. Branta canadensis occidentalis (Baird).

93. BRANTA CANADENSIS MINIMA Ridgw.
94. BRANTA NIGRICANS (Lawr.)
*95. PHILACTE CANAGICA (Sevast.) (Townsend, Auk, iii, 4, 490.)
96. DENDROCYGNA FULVA (Gmel.)
97. OLOR COLUMBIANUS (Ord).
*98. OLOR BUCCINATOR (Rich.)
99. PLEGADIS GUARAUNA (Linn.)
*100. TANTALUS LOCULATOR Linn.
101. BOTAURUS LENTIGINOSUS (Montag.)
*102. BOTAURUS EXILIS (Gmel.)
103. ARDEA HERODIAS Linn.
104. ARDEA EGRETTA Gmel.
105. ARDEA CANDIDISSIMA Gmel.
106. ARDEA VIRESCENS FRAZARI Brewst.
107. NYCTICORAX NYCTICORAX NÆVIUS (Bodd.)
108. GRUS MEXICANA (Müll.)
109. RALLUS OBSOLETUS Ridgw.
110. RALLUS VIRGINIANUS Linn.
111. PORZANA CAROLINA (Linn.)
*112. PORZANA NOVEBORACENSIS (Gmel.)
*113. PORZANA JAMAICENSIS (Gmel.)
*114. PORZANA JAMAICENSIS COTURNICULUS Baird. Extremely doubtful if ever found on Farallon Is., or in California. (Cf. Ridgway, Proc. U. S. Nat. Mus. xiii, No. 828, pp. 309–311.)
*115. GALLINULA GALEATA (Licht.)
116. FULICA AMERICANA Gmel.
117. CRYMOPHILUS FULICARIUS (Linn.)
118. PHALAROPUS LOBATUS (Linn.)
119. PHALAROPUS TRICOLOR (Vieill.)
120. RECURVIROSTRA AMERICANA Gm.
121. HIMANTOPUS MEXICANUS (Müll.)
122. GALLINAGO DELICATA (Ord).
123. MACRORHAMPHUS SCOLOPACEUS (Say).
*124. TRINGA CANUTUS Linn. (Townsend, Proc. U. S. Nat. Mus., 1887, 198.)
*125. TRINGA MACULATA Vieill.
*126. TRINGA FUSICOLLIS Vieill. (Bryant, Auk, iv, 1, 78.)
127. TRINGA MINUTILLA Vieill.

128. TRINGA ALPINA PACIFICA (Coues).
129. EREUNETES OCCIDENTALIS Lawr.
130. CALIDRIS ARENARIA (Linn.)
131. LIMOSA FEDOA (Linn.)
132. TOTANUS MELANOLEUCUS (Gmel.)
*133. TOTANUS FLAVIPES (Gmel.)
*134. TOTANUS SOLITARIUS CINNAMOMEUS Brewst.
135. SYMPHEMIA SEMIPALMATA INORNATA Brewst.
136. HETERACTITIS INCANUS (Gmel.)
137. ACTITIS MACULARIA (Linn.)
138. NUMENIUS LONGIROSTRIS Wils.
139. NUMENIUS HUDSONICUS Lath.
140. CHARADRIUS SQUATAROLA (Linn.)
141. CHARADRIUS DOMINICUS Müll.
142. ÆGIALITIS VOCIFERA (Linn.)
143. ÆGIALITIS SEMIPALMATA Bonap.
144. ÆGIALITIS NIVOSA Cass.
145. ÆGIALITIS MONTANA (Towns.)
*146. APHRIZA VIRGATA (Gmel.)
147. ARENARIA INTERPRES (Linn.)
148. ARENARIA MELANOCEPHALA (Vig.)
149. HÆMATOPUS PALLIATUS Temm.
150. HÆMATOPUS BACHMANI Aud.

ADDITIONS TO THE BIRDS OF THE GRAY'S HARBOR REGION, WASHINGTON.

BY SAM HUBBARD, JR.

Having been a resident of Gray's Harbor, Washington, for two years, viz.: from August, 1889, to 1891, I am able from personal observation to add a few species to the number observed by Mr. R. H. Lawrence, as set forth in his very interesting article in the January *Auk*, entitled: "A Preliminary List of the Birds of the Gray's Harbor Region, Washington." There are doubtless many other species observed and noted at the time, that have been left out of my incomplete list.

Gray's Harbor is the estuary or enlarged mouth of the Chehalis River. It is in the shape of a pear; the stem being the Chehalis River and the seed end being the entrance into the ocean. Three

rivers flow in from the north, viz.: The Wishkah, Hoquiam and Humptulips, and two from the south: John's River and Elk River. The harbor is very shallow, and at low tide the mud flats extend over a mile from shore. There is also a large flat nearly ten miles long bare at low tide, between the north and south channels, locally known as the middle ground. This is composed of mud at the upper end and sand at the lower end, and affords much feed for countless numbers of shore and bay birds. I am satisfied that several species of sandpipers and waders can be found there not noted in either list.

During the winter time ducks are abundant and afford much sport. From January until April canvas backs are very plenty. They feed on young clams which they dive for when the tide is in. They decoy easily and large bags are made by the sportsmen, who hide in the roots of the big spruce snags, that have drifted out of the rivers, and lodged on the mud flats.

Many ocean birds are driven in by storms and seek refuge in the harbor. As some of these outside birds are not familiar to me I have doubtless passed over a few that can be found in Gray's Harbor at any time during the winter.

Land birds, in comparison with other places I have been, are scarce. Ruffed and dusky grouse are comparatively plentiful, and also the robin, varied thrush and rusty song sparrow.

I made two trips into the Olympic Mountains by the way of Quinault Lake. On the last trip I went to the summit of the divide on the extreme head waters of the east fork of the Quinault. Birds were very scarce; in fact in the dense, damp woods of that region, life of any kind is scarce. We would tramp for hours and not see a living, breathing thing; not an ant, a bee, or an insect of any kind; not a squirrel or a bird, nothing but a vast wilderness of trees. When we reached the summit we were above the timber line, and there we found an open country covered with a beautiful growth of fresh green grass. The scent of wild flowers was in the air, humming birds and honey bees were darting about here and there, beautiful little cascades and clear mountain lakes pleased the eye, and everywhere nature appeared in her wildest and loveliest form.

1. ——— *Colymbus* sp.? Common in winter.

2. Pacific Loon. *Urinator pacificus?* Abundant.

3. ——— *Sterna* sp.? Common in winter.

4. Black-footed Albatross. *Diomedia nigripes.* Rare, driven in by storms.

5. California Brown Pelican. *Pelecanus californicus.* Tolerably common.

6. Hooded Merganser. *Lophodytes cucullatus.* Tolerably common.

7. "Whale Bird." *Puffinus* sp.? An ocean bird occasionally driven in by storms. Thousands of these birds fly in a continuous line up and down the coast, about a mile out at sea.

8. Green-winged Teal. *Anas carolinensis.* Common in winter.

9. Cinnamon Teal. *Anas cyanoptera.* Common in winter.

10. Shoveller. *Spatula clypeata.* Tolerably common.

11. Pintail. *Dafila acuta.* Between Gray's Harbor and Shoalwater Bay is a stretch of low, swampy ground called Cranberry Bog. Some few mallards breed in there, and I think also an occasional sprig and teal.

12. Red-head. *Aythya americana.* Rare.

13. Old-squaw. *Clangula hyemalis.* Tolerably common in winter.

14. Surf Scoter. *Oidemia perspicillata.* Very abundant, particularly on ocean beach. Residents along the beach claim that when these birds get washed ashore it is impossible for them to get out to sea again, owing to the pounding of the surf on the beach. My own observation tends to confirm this report.

15. Lesser Snow Goose. *Chen hyperborea.* During migrations.

16. American White-fronted Goose. *Anser albifrons gambeli.* During migrations.

17. California Clapper Rail. *Rallus obsoletus.* Saw one individual.

18. Virginia Rail. *Rallus virginianus.* Rare.

19. American Coot. *Fulica americana.* Abundant.

20. Long-billed Dowitcher. *Macrorhamphus scolopaceus.* Tolerably common.

21. Sanderling. *Calidris arenaria.* Common in winter and late into spring on ocean beach; feed on sand fleas and arrive at the season when their food is plentiful.

22. Marbled Godwit. *Limosa fedoa.* Common.

23. Greater Yellow-legs. *Totanus melanoleucus.* Tolerably common.

24. Western Willett. *Symphemia semipalmata inornata.* Very common.

25. Killdeer. *Ægialitis vocifera.* Common.

26. Mourning Dove. *Zenaidura macroura.* Have seen a few; rare near Montesano.

27. Turkey Vulture. *Cathartes aura.* Tolerably common.

28. Marsh Hawk. *Circus hudsonius.* Abundant.

29. ——— *Accipiter* sp.? Either Cooper's or the sharp-shinned hawk is quite common.

30. Western Red-tail. *Buteo borealis calurus.* Tolerably common. Several seen near Montesano.

31. Duck Hawk. *Falco peregrinus anatum.* Rare. Saw one in winter on Damon's Point catch a buffle-head duck.

32. Short-eared Owl. *Asio accipitrinus.* Tolerably common on the marshes.

33. Kennicott's Screech Owl. *Megascops asio kennicottii.* Had one alive which I took to be this variety.

34. White-headed Woodpecker. *Xenopicus albolarvatus.* Rare.

35. Pileated Woodpecker. *Ceophlœus pileatus.* One or two seen an Hoquiam River in dense timber.

36. Lewis's Woodpecker. *Melanerpes torquatus.* Tolerably common.

37. Western Nighthawk. *Chordeiles virginianus henryi.* Common in Chehalis Valley.

38. Black Swift. *Cypseloides niger.* Saw one flying over Quinault Lake that I took to be this species.

39. Kingbird. *Tyrannus* sp.? Common in Chehalis Valley.

40. Black Phœbe. *Sayornis nigricans.* Common in Chehalis Valley.

41. Clarke's Nutcracker. *Picicorvus columbianus.* Saw one or two flocks of these birds in the dense woods between Hoquiam and Quinault Lake. They are about the only birds to be seen in the depths of the woods. They feed on fir tufts and cones. They are rather silent.

42. Western Meadow Lark. *Sturnella magna neglecta.* Tolerably common resident.

43. Western Lark Sparrow. *Chondestes grammacus strigatus.* Common in Chehalis Valley.

44. Oregon Towhee. *Pipilo maculatus oregonus.* Tolerably common, particularly in Chehalis Valley and near Montesano.

45. Purple Martin. *Progne subis.* Common in Chehalis Valley.

46. Cedar Waxwing. *Ampelis cedrorum.* Saw several flocks of from fifteen to twenty on the Hoquiam River.

47. Nuthatch. *Sitta* sp.? Quite a common bird in the woods.

48. Chickadee. *Parus* sp.? Tolerably common, in flocks at all seasons.

ON THE NATURAL HISTORY OF THE FARALLON ISLANDS.

GEOLOGY AND BOTANY BY J. W. BLANKINSHIP.
ZOOLOGY BY CHARLES A. KEELER.

Thirty miles west of the Golden Gate, in the Pacific, are the Farallon Islands, composed of three groups, called the North, Middle and South Farallones, and various rocks and shoals. They have a general northwest and southeast trend, parallel with the coast, and from Noonday Rock on the North to the South Farallones is a distance of about eleven miles. All except the extreme southern are mere points of rock in the ocean, the largest being only 160 yards in diameter.

The South Farallon is nearly a mile in length from east to west, and about half that distance in its greatest width. Its greatest elevation is 343 feet, and upon this peak the lighthouse is situated. The island is visited each week from May to July by the eggers, but at other times it has only occasional communication with the shore by means of tugs and the lighthouse tender. It is chiefly noted as the largest sea-bird rookery on the Coast. The following notes refer only to the South Farallon Island, and as the result of a two-days' collecting excursion, can hardly claim to be more than a very general survey.

NOTES ON THE GEOLOGY.

The islands appear to be the projections of a granite ridge, which is elevated about 500 feet above the ocean floor. The granite is coarsely crystalline, much fissured and easily decomposed, and is mainly similar to that of Point Reyes peninsula. Sugar Loaf Rock, the northernmost extremity of the island, is a conglomerate of huge rounded boulders, and a 600-foot section of a similar sandstone is exposed at Point Reyes Light, immediately succeeding the granite.

Around the entire island, at an altitude of 50 feet above the present sea-level, an old coast line may be clearly distinguished, marked by numerous water-worn caves exactly similar to those now being eroded by the waves, and by a wave-cut terrace on the south and east sides of the island, which slopes gently from the 50-foot line to the water's edge. It is on this terrace that the dwellings of the island are situated. Great Arch Rock was excavated at this level.

There also appears to have been a short halt between this and the present sea-level, for at several points shallow and more recent caves are seen 27 feet above the sea, and a dim second terrace is shown on the west near the landing.

On the west side of Shubrick Point, on the northeast coast of the island, the caves marking the three shore-lines are found in nearly vertical position. Measurements made here showed the highest to be excavated to a distance of 186 feet, the second to about 25, and the one at the present sea-level to about 100 feet. It is said that there has been a noticeable elevation of the island in the last thirty years.

This uplift of the island reveals another interesting fact: The great wave-cut terrace is on the south and east sides, and varies from 300 yards in width on the former to about 75 on the latter, while the north and west shores are steep and precipitous. Now, the conditions being the same, the greatest amount of wave erosion is on the side of the prevailing winds, but, as is well known, the prevailing winds off the California coast are from the north and northwest. The observations of the Signal Service at Cape Mendocino and Point Reyes Light show, for monthly prevalence of winds, that 84 per cent. are from the north and northwest; even in winter, 75 per cent. are from these directions.

On the south shore of the island, near the dwellings, there are

fissures partly filled with a granitic conglomerate. Whether these fissures are natural, or were worn by the water, I was unable to determine. I also saw fragments of jasper and other rocks besides granite scattered about among the debris.

Mr. J. de la C. Posada informs me that about Carmel Bay, near Monterey, there are sea terraces at levels corresponding closely with those of the Farallones, and that a higher terrace is faintly outlined about 80 feet above the sea. This I may have overlooked at the Farallones. He found a conglomerate resting unconformably upon the granite and formed of materials eroded from it. This conglomerate is inclined at an angle of about 45°. I thought I could distinguish a marked dip toward the north in the conglomerate of Sugar Loaf Rock, but I was unable to make a close examination, owing to its separation from the island by a narrow channel, and to the roughness of the sea. The sandstone at Point Reyes Light appears to dip toward the south.

BOTANY.

The season was too far advanced for a good collection. Many species were already dead, and only dry fragments could be obtained. It is probable that a collection in May would add several more species to the list. Most of the plants here enumerated were doubtless brought over with the hay and other supplies, while those not thus introduced are given as "native." Eight species were found only in a small garden plot, protected from the rabbits, and elsewhere would be speedily exterminated. A single fresh-water alga was seen but not collected. There are no trees or shrubs on the island.

The soil is composed of decomposed granite and guano. Springs are few and small. *Bæria maritima* and *Lepigonum macrothecum* are the chief food of the rabbits; at this time of the year there was little except the latter to maintain them, and many were dying of starvation.

Only one plant—*Bæria maritima*—has been long enough isolated to show variation for which specific rank has been claimed, and it is seriously questioned whether it has departed far enough from *B. uliginosa* to be considered even a variety. This is the "Farallon Weed." It grows abundantly earlier in the season, and is said to reach a length of two to four feet. It furnishes excellent pasturage, and is highly esteemed as "greens" by the inhabitants.

PHANEROGAMS—

Introduced.

* *Stellaria media* L.
Cerastium viscosum L.
† *Malva parviflora* L.
* *Erodium cicutarium* L'Her.
† *Trifolium microcephalum* Pursh.
† *Trifolium bifidum* Gray var. *decipiens* Greene.
† *Melilotus Indica* Allioni.
* *Medicago denticulata* Willd.
* *Sonchus asper* L.
† *Anagallis arvensis* L.
† *Polygonum aviculare* L.
† *Chenopodium album* L.
* *Polypogon littoralis* Smith.
† *Avena fatua* L.
* *Poa annua* L.
* *Festuca Myurus* L.
* *Hordeum murinum* L.

Native.

Sagina occidentalis Wats.
Lepigonum macrothecum Pursh.
Lepigonum medium Fries.
Claytonia perfoliata Donn.
Tillæa minima Miers.
Erigeron glaucus Ker.
Psilocarphus tenellus Nutt.
Eritrichium californicum DC.
Phyllospadix Torreyi Wats.
Juncus bufonius L.

FERNS—

Aspidium munitum Kaulfuss. Only a single specimen collected.

MOSSES—

Funaria hygrometrica Sibth. Abundant.

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* Well established. † In garden only.

LICHENS—

Determined by Mr. M. A. Howe, of the University of California.

Theloschistes lychneus (Nyl.) Tuck. var. *pygmaeus* Fr. On high rocks.

Theloschistes ——— ? Similar situations.

Buellia petraea (Flat., Koerb.) Tuck.? On rocks.

Placodium (not fruited). On rocks.

ALGÆ—

Determined by Dr. C. L. Anderson (Diatomaceæ omitted).

Bryopsis plumosa Lmx.

Codium tomentosum Slack.

Monostroma quarternarium Desm.

Ulva latissima L.

Enteromorpha compressa Le Jolis.

E. clathrata Ag.

Cladophora scopæfornis Rupr.

C. uncialis Fl. Dan.

C. cartilaginea Rupr.

C. glomerata Ag.

Desmarestia ligulata Lmx.

Leathesia tuberiformis Gray.

Chordaria abietina Rupr.

Asperococcus sinuosus Bory.

Egregia Menziesii (Ag.) Aresch.

Laminaria Andersonii Farlow.

Alaria fistulosa Post. & Rupr.

Ptergophora Californica Rupr.

Macrocystis pyrifera Ag.

Nereocystis Lutkenana Rupr.

Fucus vesicculosus L.

F. fastigiatus Ag.

Halidrys osmundacea Harv.

Porphyra laciniata=P. vulgaris Ag.

PORPHYRA NAIADUM Anderson, n. sp.—Fronds small, seldom more than 2 inches long and ½ inch wide, very thin, spatulate with short stipes, tapering quickly into a flat membrane, with slightly wavy entire margin; dark purple or maroon; cells small, structure fragile and rapidly decaying.

This little Porphyra I have found growing only on Zostera and Phyllospadix, but it probably grows on other plants, hence the name for the order to which these two plants belong, Naiadaceæ. Some small mollusks, in rasping for food on these plants, cause abrasions, in which the spores of this Porphyra find a place to adhere and grow, so that many of the stems and leaves of these Naiads are literally covered with the brownish-purple fronds. It may be found at all seasons, wherever these weeds grow, along the whole length of our California coast.

Heretofore it has been distributed as *Porphyra vulgaris*, but without much more reason than our early botanists had for placing all seaweed in the genus Fucus.

It adheres closely to paper, and retains its natural color pretty well when mounted.

P. NEREOCYSTIS Anderson, n. sp.*—Fronds 3 to 20 inches long and 1 to 3 inches broad, very thin and ribbon-like, with nearly even or slightly crinkled edges and a somewhat pointed or oval tip; stipes very short or entirely wanting; frond often divided, sending long sections from either side; color brownish-purple, often changing to a bright carmine-purple, with a soft, glossy surface. Cells smaller, but otherwise hardly different from *P. vulgaris* Harv.

This large and beautiful Porphyra is most frequently found, on this Coast, growing on the long stems of the Nereocystis, although not always confined to that plant. Frequently it is torn loose and comes ashore in the drift, but mostly in fragments. It also has been considered only a form of *P. vulgaris*. But its structure, color and form surely entitle it to a specific place.

It adheres well to paper, and is seldom found until past midsummer, when the long stems of Nereocystis are well grown.

Ceramium diaphanum Roth.
Centroceras clavulatum Ag.
Microcladia Coulteri Harv.
M. borealis Rupr.
Ptilota asplenoides Ag.
P. plumosa Ag.=*P. filicina.*
P. densa Ag.

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* This was published — name only — in "List of California Marine Algæ," Zoe, ii, 221.

Pikea Californica Harv.
Grateloupia Cutleriæ Ktz.
Farlowia compressa J. Ag.
Prionitis lanceolata Harv. Several forms.
P. Andersonii Eaton.
Gigartina radula Ag.
G. horrida Farl.
G. papillata Ag.
G. canaliculata Harv.
Endocladia muricata Ag.
Iridea laminarioides Bory.
Callophyllis variegata Ktz.
C. laciniata Ktz.
C. furcata Farl.
Gymnogongrus linearis Ag.
Rhodymenia palmata Grev.
Cordylecladia conferta Ag.
Plocamium coccineum Lyngb.
P. violaceum Farl.
Nitophyllum multilobum J. Ag.
N. Fryeanum Harv.
N. latissimum Ag.
N. Ruprechtianum Ag.
N. violaceum J. Ag.
N. Andersonii Ag.
Gelidium corneum Lmx.
G. cartilagineum Grev.
Rhodomela floccosa Ag.
Polysiphonia Baileyi Ag.
P. Woodii Harv.
P. parasitica var. *dendroides* Ag.
Laurencia pinnatifida Lmx.
Chylocladia ovalis Hook. var. *Coulteri* Harv.
Corallina officinalis L.
C. squamata Ellis & Sol.
Amphiroa Orbigniana Harv.
Melobesia amplexifrons Harv.

ZOOLOGY.

The birds of the Farallon Islands have been collected and recorded until they are tolerably well known; but, so far as I am aware, no attempt has hitherto been made to collect representatives of all the forms of life resident upon this little group of rocks. The trip made by Mr. J. W. Blankinship and myself, on July 3, 1892, was limited by the necessities of the case to a stay of only two whole days upon South Farallon Island, but we availed ourselves of the opportunity to collect in all departments of natural history to the fullest extent possible. In so brief a stay it was manifestly impossible to do more than skim over the surface in most branches, but the lists, even in their incomplete form, may be of value in showing the character of the life of the spot. Larger collections might have been made of certain classes had not Mr. Blankinship devoted a large part of his time to the study of the geology and botany of the island, while I was engaged in observing the habits of the birds and in making collections of the young for future investigation.

The results of the survey were disappointing in one respect, viz.: that no evidence was obtained indicating that any of the animals of the islands have become differentiated from mainland forms. It may be that fuller collections, or more careful elaboration of the material obtained, would show some slight variations, although, if present at all, they are undoubtedly very incipient in nature. It would seem as if the wingless beetles and the one batrachian of the islands would be effectually isolated upon a bare rock thirty miles from the mainland, but it is impossible to say that these forms have not been accidentally introduced in recent times through the agency of man. Unfortunately, we have been unable to have some few of the spiders, insects, etc., identified, so these forms are necessarily omitted from the list.

Mr. Wm. E. Ritter named the two following radiates:

Asterias ochracea.

Strongylocentrotus purpuratus.

MOLLUSCA.

The following list of the mollusca thus far recorded from the Farallones has been kindly compiled by Dr. J. G. Cooper, from his published and unpublished lists, together with the collection of the expedition:

Martesia intercalata Cpr. (in Haliotis shells).
Entodesma saxicola, Baird.
Psephis tellimyalis Carp.
Rupellaria lamellifera Conr.
Chama pellucida Sby.
Mytilus californianus Conr. Abundant.
Septifer bifurcatus Reeve.
Modiola modiolus Linn.
Axinæa subobsoleta Carp.
Hinnites giganteus Gray. Edible.
Placunanomia macroschisma Desh.
Tornatella punctocœlata Carp.
Cryptochiton stelleri, Midd.
Mopalia ciliata Gould.
 - *vespertina* Gould.
Nuttalina scabra Reeve.
Ischnochiton magdalensis Hinds.
Leptochiton internexus Carp.
Acmæa testudinalis Müll. var. *patina* Midd.
 pelta Esch. Abundant.
  var. *asmi* Midd.
  var. *pintadina* Gould.
 persona Esch.
 scabra Nutt. Rare.
 spectrum Nutt. One of the most abundant species living about the rocks.
 mitra Esch.
Lottia gigantea Gray. Tolerably common.
Lepeta cæcoides Carp.
Gadinia reticulata Sby.
Fissurella volcano Reeve.
Glyphis aspera Esch.
Clypidella bimaculata Dall.
Haliotis cracherodii Leach.
 rufescens Swains.
 kamschatkana.
 assimilis Dall.
Phasianella compta Gld. var. *pulloides* Carp.
Leptothyra carpenteriana Pilsbry.

Chlorostoma funebrale A. Ad. Very abundant.
brunneum Phil.
montereyi Kiener.
Calliostoma costatum Mart. Abundant.
Margarita pupilla Gould.
lirulata Carp.
Crepidula adunca Sby. Common.
navicelloides Nutt.
Hipponyx antiquatus Linn.
Bittium filosum Gld.
armillatum Carp.
Littorina planaxis Nutt. The commonest shell of the islands.
scutulata Gld. Much less common than the preceding, although found together.
Lacuna solidula Louen.
unifasciata Carp.
Barleeia haliotiphila Cpr.
Trivia californica Gray.
Erato vitellina Hinds.
Conus californicus Hinds.
Odostomia inflata Carp.
Cerithiopsis tuberculata Mont.
Mitra maura Swains.
Amphissa corrugata Rve.
Purpura crispata Chem.
canaliculata Duclos.
Ocinebra lurida Midd.
interfossa Carp.
Cerostoma foliatum Gmelin.
Pedicularia californica Newc.
Fusus luteopictus Dall.

Mr. Chas. Fuchs has kindly identified the Coleoptera as follows:
Amara californica Dej.
aurata Dej.
Bradycellus californicus Lec.
Blechrus nigrinus Mann.
Tachycellus nitidus Dej.
Axinopalpus biplagiatus Dej.
Necrophorus nigritus Mann.

Hister Lecontei Mars.
Saprinus lugens Er.
Coniontis Eschscholtzii Mann.
Eleodes consobrina Lec.

I am indebted to the courtesy of Mr. Jas. E. Benedict, of the National Museum, for the identification of the following Crustacea:
Heterograpsus nudus Dana.
Pachygrapsus crassipes Randall.
Eupagurus hirsutiusculus Dana.
Ligia occidentalis Dana.
Idotea ? hirtipes Dana.
Pollicipes polymerus Sowerby.
Tetraclita porosa, var. Gmelin.

The only batrachian of the islands has been previously recorded by Cope:
Autodax lugubris.

BIRDS.

Leaving the fisherman's wharf in San Francisco in the little one-masted boat of the Greek eggers early Sunday morning, July 3, we expected to arrive at the island early in the afternoon; but the fates decreed otherwise. We set sail with a high head-wind, and for a time birds were not to be thought of as we lay below deck in darkness, with an environment of choice odors evidently made on purpose to delight the heart (and stomach) of the novice at seamanship—a bloody liver dangling at our feet and pans of stale meat at our heads. This soon grew intolerable, and we insisted upon having the after hatch opened. Standing up and breathing the fresh sea air was better than being cooped up below, although the bucketfulls of water which were hurled into our faces every few minutes by those conspirators against our peace of mind, the wind and wave, might have been thought disagreeable by the over-fastidious. The fortunate possession of a rubber coat saved me from being completely drenched, and with the exception of the seepage from an occasional injudicious shower of spray running down my neck, and a pair of wet shoes, I kept tolerably dry. The case was otherwise with my companion, however: he had no rubber coat, and was accordingly soon compelled to go below, drenched and disconsolate.

The only bird noted in the bay and about the Golden Gate was

the California guillemot, which was fairly common. It would seem from an examination of the dead bird as if the guillemot must be a slow and clumsy flier, so small are the wings in proportion to the size of the body; but, when once started in the air, they fly with great swiftness, their sharply-pointed bodies cleaving the air like a spear, and their compact little wings whirring at a great rate. They were very tame, and allowed the boat to draw quite close before making any attempt to escape. Some would then dive with an impatient jerk, but the majority would start to fly. Apparently not having the time nor energy to lift their bodies out of the water, they would flap along on the surface, splashing and scuffling in a ludicrously frantic manner. Occasionally some peculiarly energetic individual would actually lift himself above the sustaining fluid and essay to fly, but, apparently blinded in his hurry to escape, would plunge directly at the first wave that happened to be slightly higher than usual, and literally fall all over himself in the most awkward manner imaginable. I noticed that whenever the bird dived the wings were thrown out, as if to assist in swimming, instead of being folded close to the body, as with most diving birds. Later observation confirmed the theory that the birds swim under water with their wings more than with their legs, for they may frequently be seen under water from the Farallon rocks using the wings in this manner. Indeed, the form of the wing is curiously analogous to the wing of a penguin, being shaped something like a flipper, and very stiff and compact. It is, of course, only an analogy, the penguin's wing being scaled, while the character of the guillemot's wing is due to the feathers. It seems not improbable, however, that the guillemot is gradually losing the power of flight, just as the great auk lost it, in order to gain greater freedom in swimming under water. Its difficulty in rising from the water and awkwardness in falling back into it would seem to argue in favor of this view, in spite of its swift flight in a gale of wind.

In all this digression it must not be forgotten that the wind is still blowing and our little craft tumbling about as it approaches the bar in Golden Gate. An occasional Brandt's cormorant would flap past, its long neck stretched far ahead of the clumsy black body, as if trying its best to part company with so slow a companion. As we get a little way out to sea, a large rock, slightly isolated from the mainland, is noticed completely whitened with the guano of this

species, indicating the presence of a large rookery. The wind, which had been uncomfortably brisk inside the bay, left us almost entirely after we were well out to sea, and we were soon rolling aimlessly about on the broad ocean swells, with only an occasional puff of wind to make the sails flap. Thus we spent the rest of the day. The night was varied by a dense fog closing in around us, and the cheerful tones of an old tin fog-horn, with responses from two or three neighboring vessels, lent a little life to the scene for a time. Not appreciating the bits of greasy fried liver upon which our captain and crew of two made their morning, noon and evening meal, bread and claret completing the bill of fare, we went supperless to bed. On looking out early the next morning the dark, lead-colored water and foggy air looked cheerless enough, but we were consoled by the information that we were sailing under a good breeze directly towards our destination. Soon the North Farallones loomed up through the fog—little bare rocks, with the waves dashing against their sides. Presently midway rock was passed, and at last we were in sight of South Farallon. Almost before we know it the sail has been lowered, and we row past Sugar Loaf Rock into Fisherman's Bay, where the anchor is lowered and the fog-horn blown to summon the eggers on shore to send a skiff for us to land. As we lay at anchor in the little cove the sight was, indeed, a novel one. The rocks were of a light pinkish or cream color from the guano upon them, interspersed with patches of pale-green where some moss or lichen had taken root, apparently. Lower down, where the waves dash upon them, they were clean and almost black in color, while in beautiful contrast to their sombre hue the breakers were dashed into white foam and pale-green opaline tints. But the thing which interested us the most was the vast assemblage of birds. Every cranny upon the face of the rough granitic cliffs was alive with guillemots, uttering their characteristic note, some at rest, some fluttering and scrambling or bobbing their heads; the whole scene being one of indescribably weird animation, and unlike anything else imaginable, unless it be the witches in Faust on Walpurgis night. Here and there the black figure of a cormorant upon her nest was noticed, or one would fly by with a fish in her bill, headed toward her nest. An occasional puffin *(Lunda cirrhata)*, or sea parrot, as it is aptly called, would fly past the boat, with its immense odd bill of red and the big patch of white on the head in striking

contrast to the dark color of the body. By far the most familiar birds were the western gulls *(Larus occidentalis).* They flocked about the boat in considerable numbers, displaying their beautiful dark slate-blue mantle and yellow bills with the scarlet patch near the tip. They were attracted by the refuse from the men's breakfast, which was thrown overboard in the cove. In spite of their fine plumage and graceful actions, they proved to be a disagreeable, noisy, quarrelsome bird.

After a half-hour of impatient waiting a skiff was lowered into the water from the sling in which it hangs from the rocks, and a man came out to land us, bags and baggage. Not until we were in the skiff bound for shore, and in the comparatively quiet waters of the cove, did I realize to its fullest extent the pleasures of a sea voyage by getting seasick; and then to lie down and watch my companion consume a good breakfast after a fast of thirty-six hours, and be able to join him only in spirit!

However, there was no time for lamenting the inevitable. Shortly after we had become established in our quarters at the residence of the head light-keeper, the eggers started to gather the eggs on the portion of the island known as West End, and we learned that it would be our only opportunity to visit that district, as the eggers object to disturbing the birds except just after they have plundered them.

The eggers had refused to allow us to take a gun to the islands, but we found two young men there from San Francisco, who had come on the tug, and were provided with that implement so necessary to the bird collector. One of them, Mr. H. M. Anthony, very kindly went with me and assisted in securing such birds as I desired.

As we started off, following the course of the eggers, the gulls were by far the most conspicuous and noisy birds seen. Their most common note may be expressed by the syllables *quock kuck kuck kuck*, uttered very rapidly in a low, guttural tone. Sometimes it was varied thus—*kuck kuck kuck ka*—the quality of tone being the same as in the first instance. Frequently a higher cry would be heard, which may be indicated by the letters *ki aa*, with a strong accent on the first syllable. Again, one would utter a rattling, guttural cry, which sounded like a man being throttled. The young were quite common about the rocks, white in color, everywhere spotted with dark dusky. At the approach of an enemy they would

run and attempt to squeeze into any little cranny in the rocks they happened to espy, but were very readily caught by hand. The nest is a simple affair composed of dry weeds, mostly *Bæria maritima*, and placed almost anywhere upon a rocky hillside. No nests were observed on the steep cliffs overhanging the sea, the favorite situation being a hillside of moderate slope. The eggs are remarkably well protected in color, and the nest itself is so trifling an affair that it may frequently be almost stepped upon without being discovered, unless the attention is especially directed towards finding it. The birds are extremely noisy and vociferous as long as an intruder remains in their territory, hovering over him in large numbers and swooping upon him with menacing cries and gestures. Altogether, one feels more comfortable when he gets off their preserves. But the birds are remarkably inconsistent, for they are inveterate plunderers themselves. As the eggers go about the rocks, starting all the birds from their nests, the gulls follow closely in their train, breaking every cormorant's egg which comes in their way and devouring the contents. They even manage to crack the tough shell of the guillemot's egg if any should be passed by the eggers.

Continuing our scramble up the rocks, we presently reached the summit of the west end, where a wonderfully grand spectacle was unfolded to view. We found ourselves on the very edge of a precipice with a sheer drop of several hundred feet, perhaps, to the sea, which was breaking on the rocks below. All about the rocky ledges were rows of guillemots, frequently huddled together in enormous numbers. I sat down and made rough sketches of the birds, illustrating some of the attitudes they assumed. While observing them, one which sat upon the topmost ridge stretched its neck out and, leaning over, looked down at the sea as if contemplating a plunge. Others were busy dressing their plumage, while now and then one would rise up and flap its wings and then settle down again. A group of the birds drawn from life is represented in Plate xviii. So large a concourse of these birds is a strange sight indeed, and one furnishing much food for reflection. Here we see the social instinct in one of its most primitive forms. A community of ants or bees is far in advance of an assemblage of sea birds. Here they live, each pair with a piece of property and home of their own, a little nook of rock with a single egg upon it; and the own-

ers have well-defined ideas of individual rights and the impropriety of "jumping claims." Mr. Walter E. Bryant, in his Birds and Eggs from the Farallon Islands,* suggests that the curiously pronounced pear shape of the guillemot's egg is "an all-wise provision * * * preventing it from rolling off of a slightly inclined plane"—by which he means, I suppose, that it has been brought about by natural selection. This is a very interesting observation regarding the significance of the shape of the egg, and certainly seems to be perfectly plausible. The color of the guillemot's egg is no less remarkable than the shape. No two individuals lay eggs exactly alike; in fact, there is probably no bird which displays so great a diversity with respect to color and markings as the guillemot. Still more interesting: one of the eggers, a man of intelligence and veracity, apparently, informed me that the same pair of birds always laid the same style of an egg. He said that on particular isolated ledges where only a single pair built he would invariably find one form of marking upon the egg. Thus, on taking the egg from some known spot on alternate days, he would observe it was invariably scrawled, or from some other nook constantly unmarked white, while a third cranny would yield an egg spotted in a particular way. If this observation be true it is of considerable interest, and may perhaps furnish a clue to the reason for the diversity of type in the eggs. With most birds the color of the egg varies but little from the type of the species, and we may accordingly infer that the particular color is of some use, and is preserved by natural selection. The form of the egg is frequently more variable than the color, but with the guillemot the reverse is the case. The shape is remarkably constant, and there seems to be a good reason why it should be so. But there appears to be an equally good reason why the color should be variable. In nesting in great numbers close together there might frequently be difficulty in keeping each pair's property distinct if all the eggs were alike, but this difficulty would be entirely obviated if each pair laid a different style of egg. Natural selection, then, would not tend to preserve any one type of marking, but would rather encourage as great diversity as possible. If a pair does always lay the same style of egg the birds would learn their own kind once for all. This would be especially useful if the

* Proc. Cal. Acad. Sci. 2d Ser. Vol. I, p. 35.

same pair mated year after year. The observation upon the constancy of the color of eggs of a single pair would need confirming by competent scientific authority, however, before it could be entirely credited.

As I sat sketching the guillemots on the crest of the rock, their curious habit of bowing was repeatedly noticed. The first one in a row will deliberately bow his head, perhaps once, or sometimes two or three times, followed in turn by each one in the assembly. What the purpose of this curious maneuver is I was utterly unable to make out. The explanation that naturally suggests itself is that it is in some way connected with the courting of the birds, although there was really nothing to confirm this view.

Brandt's cormorant was also very abundant upon this West End ledge, and nested there in large numbers. Between the eggers and the gulls the birds of this section have a hard time of it, however, and no young of either the guillemots or Brandt's cormorant were discovered. After securing specimens of the adult of these species, together with a stray puffin, we started on our return course, visiting the rookery of Farallon cormorants on the way. Drawings were made of the old birds in various attitudes, and of the young in the nest. Plate xix shows a group of the young, with adult in the distance. The young are about as ugly specimens as nature ever permits, the comparison to a black greasy kid glove being especially apt in describing them. They are almost destitute of feathers, a little dark fuzz here and there indicating where they will eventually appear, while the pin-feathers may have started as dark-colored quills. On approaching a nest of young they would open their immense mouths and stretch their necks angrily towards the intruder, uttering a low, hoarse, plaintive *kwa kwa kwa kwa kwa*. On drawing nearer the cries are louder and very violent, the birds squawking loudly. One nest that I observed particularly, contained two young, one much larger than the other. As we sat watching them at a short distance the older bird was noticed preening and caressing the younger with its bill—a notable example of brotherly or sisterly affection. When the younger bird was removed and transferred to the collecting basket, however, the older one, instead of manifesting a decent amount of grief over the loss of its companion, commenced preening and dressing its own greasy skin in the most unconcerned manner imaginable the moment its own safety

was no longer menaced. Mr. Anthony called my attention to the fact that the nests of Brandt's cormorant were decorated around the sides with fresh seaweed, while the Farallon and Baird's cormorant built their nests exclusively of dried weeds, principally *Bœria maritima.*

We also visited the nesting place of Baird's cormorant, and obtained specimens of the old and young. This bird is less common than the other two cormorants and less communistic in its habits. It appears to resort to steep cliffs upon which to build its nest, while the other two species build upon a sloping hillside, as a rule. One solitary Baird's cormorant was noticed sitting upon her nest on a little shelf of rock only about fifty feet above the booming surf, and completely isolated not only from other individuals of her own species but from all the other birds of the island. A lonely life indeed amid the wild desolation of nature. Figures 1 and 2 of Plate xxi indicate the differences in the bill of the Farallon and Baird's cormorant. The former has a considerably longer bill, and there is quite a well marked difference in shape, even at this early age. The color of the skin is also quite distinct in the two species, being almost black or dark slate colored in the Farallon, and a seal brown in Baird's.

The return from the morning's collecting trip was made under difficulties for we had so many birds to carry that we could barely walk under the weight of some twelve cormorants, together with a few guillemots, puffins and auklets. The afternoon of the "glorious Fourth" was consumed in making rough skeletons of some of the birds, and putting others away in alcohol, while the evening was devoted to writing up the notebook. The following morning was largely taken up with collecting the shells and other marine life among the rocks, together with some insects, but I also managed to visit the nesting place of the puffins *(Lunda cirrhata)*, and Cassin's auklet *(Ptychoramphus aleuticus)*. The steep rocky hillside in which they nested was composed of a sort of coarse shale-like granite in which there were many fissures offering a safe retreat for the birds. Peering into some dark cranny a puffin would be barely visible at the further end. I was immediately struck with the use of the conspicuous white patch upon the face as a socialistic recognition mark. Were it not for this the bird would be completely invisible from the entrance to the burrow, and it would doubtless be a matter of con-

siderable convenience in the social intercourse of the parent birds. It is a significant fact that the patch is white, as with the markings about the head in so many mammals that live in burrows. There is, however, another use in this white patch of the sea parrot. I noticed that the setting bird always faced the entrance to her retreat, exposing the white patch in full view. On seeing this special precautions were used in inserting the hand to prevent being bitten, for the bite of a puffin is a dangerous thing. It is quite evident that this white patch must serve as a warning for intruders to keep off, and is one of the few cases of warning colors among birds which have come to my notice.

A series of the young of Cassin's auklet was obtained, but the bird is nocturnal in habits so that very little was seen of the adult. Figure 3 of Plate xxi shows the young puffin's head, the bill, even at this early stage of development being greatly enlarged and transversely grooved. The bird is feathered when hatched, apparently, at least the youngest specimen obtained was completely so, and of a dark brown color. Figure 5 shows the head of Cassin's auklet. It may be recognized at the earliest age obtainable by the little upturned snub bill and the gray feet.

In size and general color the young of the pigeon guillemot is not unlike the young of Cassin's auklet, both being dark-brown in color; but the difference in the shape of the bill, as shown in Figure 4 of Plate xxi, is very marked, as is also the character of the feet. The throat of the guillemot is feathered, while in the auklet it is almost naked, and of a dark slaty color.

Mr. Anthony noticed Cassin's auklets nesting along the sides of one of the caves which he explored, which is quite an unusual habit with this species. I noticed that they also nest on level ground in crannies under loose rocks. At night, especially if the moon is up, the birds are very abundant and noisy. Their note resembles the creeking of a rusty gate, and may be represented by the syllables *creek a reek! creek a reek! creek a reek!* Another nocturnal bird is the ashy petrel *(Oceanodroma homochroa)*. It is perhaps not so rare upon the island as it is difficult to find. Mr. Anthony obtained a large number of eggs and birds by systematically turning over rocks on a hillside where they were known to be found. The nest is frequently, though by no means invariably, indicated by the strong musky odor in its vicinity. The flight of the petrel was light, quick

and noiseless, reminding one somewhat of the flight of a bat. I did not hear any note uttered by the bird. The irrepressible gulls were also abroad at night and their note at that time sounded as a pensive wail indescribably weird and mournful as it mingled with the creeking of multitudes of auklets and the roar of the waves and wind whistling about the sharp points of rock.

There is but one other sea bird which nests about the islands of which no particular mention has been made—the pigeon guillemot *(Cepphus columba)*. It is very common, although never seen congregating in such immense numbers as the California. When sitting upon the rocks facing the observer it appears to be a very dark brown bird with conspicuous scarlet feet. This brilliant color is undoubtedly a recognition mark as is also the characteristic white patch on the wing which is conspicuous both when the bird is at rest and in flight. Plate xx represents a group of the birds, the attitudes having been taken from life. The most characteristic attitude of the bird is an erect posture, with the entire foot upon the ground. Frequently it will squat flat down among the rocks, however. They may frequently be seen with fishes in their bills, but I was unable to determine whether for their own use or to feed the young. When anyone approaches they sit with their long slender bills wide open and utter a high pensive long drawn out squeak—*peeeeeeeeie*. Young birds were obtained from crannies in the rock, in much the same sort of place as the auklets breed.

In the foregoing account of the water birds breeding upon the Farallons little or nothing has been said of the eggs both because they have all been described and because my own efforts were directed towards obtaining the young birds and such few eggs as were found well incubated.

Only two land birds nest upon the island, the raven *(Corvus corax sinuatus)*, which is very rare but undoubtedly breeds there, and the rock wren *(Salpinctes obsoletus)*, which is extremely abundant and nests all over, at least the lower parts of the island. The black turnstone *(Arenaria melanocephala)*, was fairly common along the beach. No evidence of their breeding was discovered but it is a little remarkable that they have been recorded by Mr. Emerson*

*Bryant l. c. p. 44.

in May, June, July and August, if they do not nest there. But one addition to the list of birds published in Mr. Bryant's catalogue was made, the Carolina rail *(Porzana carolina)*. A specimen was shot by Mr. W. A. Beeman, head light-keeper, in August, 1890, and is now in his possession mounted.

It will not be necessary to detain the reader with a narrative of the remainder of the trip, as nothing new in the way of birds was discovered. Early on the morning of July 6, we received news that the egg boat was ready to return, so after hastily packing we soon found ourselves pitching about in a rough sea, en route for San Francisco.

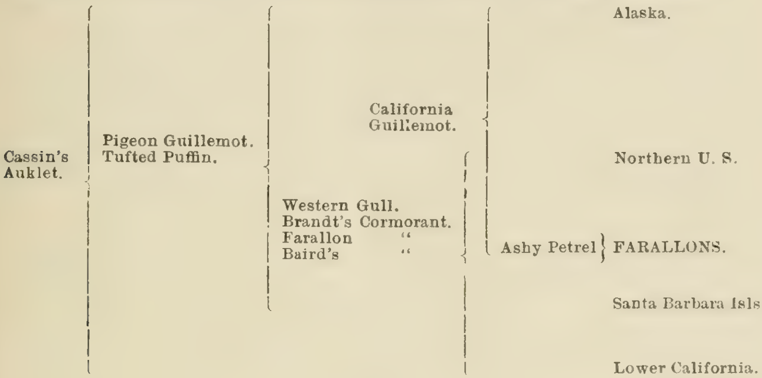
It may be fitting to close this account of the birds of the Farallones with a word on their geographical distribution in general. The water birds which nest upon these isolated rocks are such species as frequent the rocky islands and mainland of the north Pacific, as far north as Alaska. Indeed, the Farallones appear to mark the southern limit of breeding range of one or two species. Mr. Clark P. Streator* has noted the tufted puffin, Cassin's auklet, western gull, pigeon guillemot and the three cormorants of the Farallones breeding upon the Santa Barbara Islands. Of this number Mr. Bryant, in his Catalogue of the Birds of Lower California† records Cassin's auklet as breeding as far south as San Geronimo Island (Anthony), and the western gull as breeding on Todos Santos Islands off Ensenada and upon the Island of San Pedro Martir (Goss). The California guillemot I do not find recorded as breeding south of the Farallons. All three cormorants are found in Lower California and probably all breed from there north to Washington as stated in the A. O. U. Check List.‡ The ashy petrel has not been recorded, I believe, as breeding at any point except the Farallones. The com-

*O. & O. xiii, pp. 53-54.

†Proc. Cal. Acad. Sci. 2d Ser. vol. ii, pp. 250-251.

‡pp. 110-111.

parative distribution of the birds of the Farallones with regard to their breeding range may be graphically represented as follows:



MAMMALS.

As might be expected there are no land mammals native to the Farallones. Rabbits have been introduced and have multiplied until they are extremely abundant and very tame. They are of every imaginable shade of color from black, through brown and gray to white, sometimes clear, frequently mottled. During the dry season, the light-keeper informs me, they die off in great numbers owing to lack of food.

Sea Lions *(Eumetopias stelleri)*, are common, especially upon the North Farallones. Mr. Beeman informs me that fur seals *(Callorhinus ursinus)*, occasionally visit the islands during the winter months and also the leopard seal *(Phoca vitulina)*.

NOTE.—There are two more species which were overlooked and which should be added to the list of California water birds published in this issue.

NUMENIUS BOREALIS (Forst.) Recorded from San Diego by Mr. Holterhoff. (Auk, i, 4, 393.)

XEMA SABINII (Sab.) A specimen (No. 379) is in the collection of the California Academy of Sciences. It was taken on San Francisco Bay in October, 1889, and was identified by Mr. Belding.

W. E. B.

THE NOMENCLATURE OF PLANTS.

BY KATHARINE BRANDEGEE.

This subject is at present attracting a large amount of the attention of systematic botanists. An international botanical congress is to be held in Genoa next month, at which the questions will probably be freely discussed, although, from the known wide diversity of opinion, agreement is hardly to be hoped for. Of one thing we may be assured beforehand — the so-called "Kew rule," or rule of convenience, so tenaciously held in certain quarters, and reaffirmed in a posthumous letter by Dr. Watson, will have a numerically scant following. It is quite sufficient to imagine the ghastly state of affairs if Kuntze, in addition to his other liberties, had taken this and renamed the species according to fancy.

The following circulars, the first to botanists in general, the second to the botanists of America, have been sent out for the signatures of those who agree with them:

"PROPOSITIONS TO AN AMENDMENT OF THE 'LOIS DE NOMENCLATURE BOTANIQUE.'

Since the time of Linnaeus botanists have continually endeavored to gain a uniform nomenclature, and these endeavors were completely justified on account of an easier mutual understanding. We know very well that certain differences will always remain, because the decision on some questions only depends on the author's subjective opinion. But we hope that a gradual and continual reformation will bring an essential improvement. O. Kuntze's Revisio generum has raised an evident perturbation, and will cause a complete confusion; therefore, we thought it necessary to propose the following four resolutions, which refer only to the genera:

I. The starting point of the priority of the genera, as well as the species, is the year 1752, resp. 1753.

II. Nomina nuda and seminuda are to be rejected. Pictures alone, without diagnoses, do not claim any priority of a genus.

III. Similar names are to be conserved if they differ by ever so little in the last syllable; if they only differ in the mode of spelling, the newer one must fall.

IV. The names of the following larger or universally known genera are to be conserved, though after the strictest rules of pri-

ority they must be rejected; in many of them the change of the names now used is by no means sufficiently proved:

Ad 1. After Alph. de Candolle had proposed to take the year 1737 as the starting point of the priority of genera, many botanists had acknowledged it. But we think that the turning point from the ancient botany to our modern science rests in the introduction of the binominal nomenclature. Therefore, we propose, after a previous communication with Alph. de Candolle, to remove the starting point for both the species as well as the genera as far as to the year 1753, resp. 1752, date of the species plantarum ed. I. (1753), with the IV. ed. of the genera plantarum (1752). Before that time the scientific position of Linnaeus is not superior to Tournefort, Rivinus and many other botanists, who often had described and segregated the genera more exactly than he did.

Ad 2. Many genera have been founded on a picture only, without a diagnosis. No doubt by means of it a species sometimes can clearly be made out and recognized; and if the picture is a good one, all the characteristics of the plant can be observed. But a picture can never show the special characteristics alone which raise the genus above the other of its affinity. A genus only gains priority by a verbal diagnosis, and nomina nuda and seminuda are to be rejected; therefore, the following works cannot claim a right of priority: Rumphius, Herbarium Amboinense (1741–1755), Burmann, Flora Indica (1768), Patr. Browne, History of Jamaica (1756), Lamarck, Illustration des genres pro parte, etc.

Ad 3. There are to be conserved *Adenia* as well as *Adenium*, *Acnista* as well as *Acnistus*, *Alectra* as well as *Alectryon*, *Apios* as well as *Apium*, *Rubia* as well as *Rubus*, *Bellis* as well as *Bellium*, *Chloris* as well as *Chloraea* and *Chlora*, *Glyphaea* as well as *Glyphis* and *Glyphia*, *Calopogon* as well as *Calopogonium*, *Atropa* as well as *Atropis*, *Galax* as well as *Galaxia* and *Galactia*, *Danaë* as well as *Danais*, *Drimia* as well as *Drimys*, *Glechoma* as well as *Glechon*, *Hydrothrix* as well as *Hydrotriche*, *Micranthus* as well as *Micrantheum*, *Microtea* as well as *Microtus*, *Platystemma* as well as *Platystemon*, *Silvaea* as well as *Silvia*, etc.; we doubt that there is any scholar who will confound them. On the contrary, *Tetraclis* and *Tetracleis*, *Oxythece* and *Oxytheca*, *Epidendrum* and *Epidendron*, *Oxycoccus* and *Oxycoccos*, *Asterocarpus* and *Astrocarpus*, *Peltostema* and *Peltistema*, are only different modes of spelling the same word, and the newer one is to be refused if they name different genera.

Ad 4. The impulse that led to the acknowledgment of the right of priority was only the vivid desire to create a stable nomenclature. If we see that by the absolute and unlimited observance of the principle we probably gain the contrary of what we intended, we, who have ourselves made the rules of priority as a law, have the right to amend the latter. Therefore, we present a list of genera that have more than a merely scientific interest, or that are very large, and we propose to conserve them in spite of the rules of priority, in order to avoid a general confusion by the change of many thousand names.

The Committee—P. Ascherson, A. Engler, K. Schumann, I. Urban.

We agree to the four resolutions—A. H. Berkhout, R. Beyer, C. Bolle, R. Büttner, U. Dammer, B. Frank, A. Garcke, E. Gilg, M. Gürke, P. Hennings, O. Hoffman, L. Kny, E. Koehne, G. Krabbe, F. Kränzlin, L. Krug, M. Kuhn, G. Lindau, E. Loew, P. Magnus, F. Niedenzu, F. Pax, H. Potonié, O. Reinhardt, R. Ruthe, S. Schwendener, P. Taubert, G. Volkens, O. Warburg, A. Winkler, L. Wittmack, E. Wunschmann.

Num. spec.	Nomina Conservanda.	Nomina Rejicienda.
5	Erophila DC. (1821)	Gansbium Ad. (1763)
50	Jonidium Vent. (1803)	Calceolaria Löffl. (1758)
4	Spergularia Pers. (1805)	Tissa v. Buda Ad. (1763)
40	Ternstroemia Thbg. (1794)	Mokofua Ad. (1763)
80	Malvastrum A. Gr. (1849)	Malveopsis Prsl. (1844)
11	Cola Schott et Endl. (1832)	Edwardia Raf. (1812)
17	Podalyria Lam. (1795)	Aphora Neck. (1790)
200	Oxytropis DC. 1802)	Spiesia Neck. (1790)
155	Desmodium Desv. (1813)	Meibomia Heist. ex Fabr. (1763)
80	Adesmia DC. (1825)	Patagonium Schrk. (1808)
55	Barringtonia Forst. (1775)	Huttum Ad. (1763)
70	Sonerila Roxb. (1820)	Cassebeeria Dennst. (1818)
30	Rhipsalis Pers. (1805)	Hariota Ad. (1763)
10	Paederia Linn. (1767)	Hondbesseion Ad. (1763)
16	Liatris Schreb. (1791)	Laciniaria Hill (1762)
140	Mikania W. (1803)	Willoughbya Neck. (1790)
115	Blumea DC. (1833)	Placus Lour. (1790)
28	Euryops Cass. (1818)	Jacobaeastrum Man. (1751)
24	Gazania Gärtn. (1791)	Meridiana Hill (1761)
160	Cirsium Scop. (1761)	Cnicus et Carduus L. 1753 ex. p.
80	Scaevola Linn. (1772)	Lobelia Ad. (1763)
50	Armeria Willd. (1807)	Statice Fabr. etc. (1759)
120	Statice Willd. (1807)	Limonium Fabr. etc. (1759)
3	Chonemorpha Don (1837)	Bellutakaka Ad. (1763)
50	Oxypetalum R. Br. (1809)	Gothofreda Vent. (1803)

Num. Spec.	Nomina Conservanda.	Nomina Rejicienda.
50	Herpestis Gärtn. (1805)	Brami Ad. (1763)
3	Tectona L. fil. (1781)	Theka Ad. (1763)
10	Aerva Forsk. (1775)	Uretia Ad. (1763)
45	Suaeda Forsk. (1775)	Dondia Ad. (1763)
90	Myristica L. f. (1781)	Comacum Ad. (1763)
30	Isopogon R. Br. (1810)	Atylus Sal. (1807)
14	Stenocarpus R. Br. (1810)	Cybele Sal. et Kn. (1809)
3	Telopea R. Br. (1810)	Hylogyne Sal. et Kn. (1809)
47	Dryandra R. Br. (1810)	Josephia Sal. et Kn. (1809)
24	Leucospermum R. Br. (1810)	Leucadendron Sal. et Kn. (1809)
60	Persoonia Sm. (1798)	Linkia Cav. (1797)
12	Nivenia R. Br. (1810)	Paranomus Sal. et Kn. (1809)
70	Leucadendron R. Br. (1840)	Protea Sal. et Kn. (1809)
3	Knightia R. Br. (1810)	Rymandra Sal. et Kn. (1809)
60	Protea R. Br. (1810)	Gagnedi Bruce (1790)
46	Banksia L. f. (1781)	Sirmüllera O. Ktze. (cf. ap. Pimeleam)
10	Sorocephalus R. Br. (1810)	Soranthe Sal. et Kn. (1809)
9	Lomatia R. Br. (1810)	Tricondylus Sal. et Kn. (1809)
76	Pimelea Gärtn. (1788)	Banksia Forst. (1776)
20	Struthiola L. f. (1767)	Belvala Ad. (1763)
12	Exocarpus Lab. (1798)	Xylophyllos L. (1771)
20	Julocroton Mart. (1837)	Cicca Ad. (1763)
175	Pilea Lindl. (1821)	Adicea Raf. (1815)
330	Dendrobium Sw. (1799)	Callista Lour. (1790)
30	Angraecum Lindl. (1826)	Angorchis Thou. (1809)
40	Polystachya Hook. (1824–25)	Dendrorchis Thou. (1809)
60	Eulophia R. Br. (1823)	Graphorchis Thou. (1809)
80	Spiranthes Rich. (1818)	Gyrostachys Pers. (1807)
400	Pleurothallis R. Br. (1813)	Humboldtia R. et P. (1794)
120	Liparis Rich. (1818)	Leptorchis Thou. (1809)
100	Bolbophyllum Spr. (1826)	Phyllorchis Thou. (1809)
85	Eria Lindl. (1825)	Pinalia Ham. (Febr. 1825)
60	Coelogyne Lindl. (1825)	Pleione Don (Febr. 1825)
8	Libertia Spr. (1825)	Tekel Ad. (1763)
19	Patersonia R. Br. (1807)	Genosiris Lab. (1804)
5	Hosta Tratt. (1812)	Saussurea Salisb. (1807)
59	Haworthia Duv. (1824)	Catevala Ad. (1763)
9	Astelia R. Br. (1810)	Funckia W. (1808)
36	Dracaena Jurs. (1767)	Draco Ad. (1763)
22	Thysanotus R. Br. (1810)	Chlamysporum Salisb. (1809)
3	Agapanthus l'Hérit. (1788)	Tulbaghia Heist. (1753)
30	Cyanotis Don (1825)	Tonningia Neck. (1790)
28	Dichorisandra Mik. (1820)	Stickmannia Neck. (1790)
40	Luzula DC. (1805)	Juncodes Ad. (1763)
60	Chamaedorea W. (1804)	Nunnezharia R. et P. (1794)
50	Pandanus L. f. (1781)	Keura Forsk. (1775)
20	Hydrosme Schott (1858)	Corynophallus Schott (1857)
215	Paepalanthus Mart. (1833–35)	Dupatya Vell. (1825)
200	Fimbristylis Vahl (1806)	Iria Rich. (1805)
33	Rottboellia L. f. (1781)	Manisuris L. (1771)
20	Setaria Beauv. (1812)	Chamaerhaphis R. Br. (1810)
3	Phyllocladus Rich. (1826)	Podocarpus Lab. (1806)
40	Podocarpus l'Hèrit. (1810)	Nageia Gärtn. (1788)"

"In view of the International Botanical Congress to be held at Genoa, Italy, September 4th to 11th, 1892, we, the undersigned American botanists, favor the adoption of the following general principles of nomenclature:

I. The adoption of initial dates for generic and specific names.

II. That the publication of a generic name or a binominal specific name invalidates the use of the same name for any subsequently published genus or species.

III. That in the transfer of a species to a genus other than the one under which it was first published, the original specific name is to be preserved, unless such name has previously been employed in the genus to which the species is transferred; and if the author who transfers such species alters the name, it may be restored by any subsequent author.

IV. That a varietal name be treated as equal in rank to a specific name, in its relations as a homonym and in the transfer of species and varieties from one genus to another.

Frederick V. Coville,	Arthur Hollick,
B. T. Galloway,	Elizabeth G. Britton,
J. M. Holzinger,	Anna Murray Vail,
Walter H. Evans,	Byron D. Halsted,
F. H. Knowlton,	Thomas C. Porter,
Lester F. Ward,	John K. Small,
George B. Sudworth,	J. Bernard Brinton,
N. L. Britton,	Timothy F. Allen,
Thomas Morong,	H. H. Rusby."
William E. Wheelock,	

To the first article in both propositions there is perhaps no serious objection—if the proposers can show that such alteration of the present rule offers any adequate compensation for the disturbance it will entail.

The second and third articles of the Berlin proposition merely formulate the existing practice of most naturalists, but many would like to amend by outlawing all such names as are founded on distributed sets, *i. e.*, dating them not from such distribution, but from the appearance of a diagnosis in print.

The fourth article would be an instance of special legislation, repugnant to the sense of justice of most botanists There are a great

many other genera in similar or even worse case, and why should these particular ones be singled out? And then, again, the name of P. Taubert signed to the articles can hardly fail to remind botanists of his recent resurrection of Aublet's generic names and inexcusable transference of all the species—of course attaching "Taub." to them; and to call attention to the fact that among the list to be conserved "in spite of the rules of priority, in order to avoid a general confusion by the change of many thousand names," those discredited by Taubert do not appear.

The second article of Dr. Britton's proposition is out of order until—at least—it shall have been adopted by zoologists in general and found to be useful in working. In botany such a rule—if made retroactive—would be of very small advantage and productive at the outset of almost infinite confusion. As a rule for present action there could be no possible exception, and a careful systematist will go farther and refrain from the giving of a generic name which has been used in zoology.

The third article is in accord with the principles and practice of most botanists, but the opponents though few are powerful. It has always seemed odd to me that if the principle of priority were admitted at all, there should ever be a question of the propriety of adhering to it in specific names, the species being the unit and generic, tribal, ordinal, etc., merely classifying names. The claim that "the oldest specific name under the proper genus" should be conserved, is little less than an absurdity—for who in these days shall say when the "proper genus" has been reached, and meantime in the irresponsible hands of Rafinesquians how many binomial synonyms may be inflicted upon us?

The fourth article is in my opinion illogical and inadmissible.

Some of the lighter and more diverting phases of our nomenclatural woes are dealt with by Prof. E. L. Greene who, in Pitt. No. 11, finds himself "minded" to take up the cudgels in behalf of Dr. Kuntze's "Revisio" and the first edition of the Systema as a starting point. In objecting to a review by Dr. Schumann he says: "Against the 1735 starting point Dr. Schumann assumes the singular and surely untenable position that the work as regards genera is a list of naked names without diagnoses." If Mr. Greene had ever seen a copy of the first edition of the Systema he would perhaps not have made the remark, which shows so well the danger of

dealing with matters not sufficiently understood. The classification of plants is in that work spread out in tabular form over two great folio pages; in these two pages there are under the mark "† Nova genera a me constituta" twenty-five genera without any mark or reference or means of diagnosis other than that afforded by "Triandra monogynia," etc., and ten times as many with no mark whatever beyond the bare word.

A second of his amusing "pronouncements" is the following: "*Watsonamra* has few if any chances of perpetuity, the genus of palms, *Serenoa*, apparently precluding it; for never yet has it been admitted that two generic names may stand in honor of the same man." We commend these remarks to our friends the mycologists in the light of, say "Saccardia," "Saccardinula," "Saccardoella," etc. Perhaps when Professor Greene and his vagaries have been forgotten some botanist, equally desirous of notoriety, may be enabled to coin a generic name or two by discovering that "Greenella" and "Greenina" are merely synonyms of "Chlora" and "Chloræa."

A NOTE ON NOMENCLATURE.*

BY ALPHONSE DECANDOLLE.

Many botanists are alarmed by the changes in the generic names of plants proposed by Kuntze. But the researches which have been made, and the opinions which are daily published on the subject of nomenclature, may, however, give some reassurance.

I have had the curiosity to ascertain what generic names Kuntze claims should be changed in the twenty-six families which I have been studying, either for the Prodromus or the first volume of our Monographiæ, and their number is twenty-eight. Now, after an attentive consideration of the reasons given by Kuntze, only six names are found which require to be changed by the application of the well-known law of priority, while twenty-two of the changes are inadmissible.

Dr. Briquet, who is better acquainted with the family of the Labiates than any other person, has found that of the fifteen changes proposed by Kuntze, only five are justifiable, while ten are not admissible.

* Translated for Zoe from Journal of Botany, May, 1892, by C. C. P.

After these two examinations, made conscientiously, *the number of the changes proposed by Kuntze must be reduced by two-thirds.*

While rendering, therefore, due justice to the learning and accuracy of this scientist, I am bound to say that there are several sources of error in his conclusions. I will call attention to the two most important ones:

(a) Kuntze takes for genera names only apparently generic, and which are not accompanied by characters sufficiently descriptive of them. A genus is only constituted by the union of a name and the distinctive characters of the plant. Without that it is a genus stillborn. It is *nil*, and therefore can produce no result, especially in the application of the law of priority. All botanists are agreed about *nomina nuda* or *seminuda*.

(b) The starting point for the genera of Linnæus is certainly his *Genera* of 1737, and not his *Systema*, ed. 1, of 1735. This latter had only for its object to make known the twenty-four classes of the author. Some names of genera are indicated there, but without special characters, for the genus is not defined by the single notion conveyed by the term Hexandria or Pentandria digynia. It was in 1737 that Linnæus enumerated and characterized all the genera he was acquainted with, in his *Genera*, in which he abandoned the names of the *Systema*, regarding them, no doubt, as useless.

In my *Nouvelles Remarques sur la Nomenclature*, in 1883, I have explained why we should start from the *Genera* rather than from the *Systema*, and I have seen with pleasure this opinion recently sustained by Daydon Jackson (Bot. Journ. February, 1892); Botanical Gazette (March, 1892); and Schumann (Naturwiss, Rundschau, Jarhrgang 7, No. 13). The remarks of this latter scientist, favorable to our laws of nomenclature of 1867, have a value so much the greater because he says: *An understanding had been arrived at, before their publication, with the botanists of Berlin and some foreign botanists.*

The principles which I maintained in 1867 and in 1883 are thus supported by good judges, and I confess it is a great satisfaction to me in my old age.

RECENT LITERATURE.

Darwin and After Darwin. An Exposition of the Darwinian Theory and a Discussion of Post-Darwinian Questions. By GEORGE JOHN ROMANES, M. A., L. L. D., F.R.S. I. The Darwinian Theory.* Ever since the publication of the Origin of Species by Means of Natural Selection, scientists have been at work adding testimony of the fact of evolution and discussing theories explanatory of the fact, until, at the present time, the literature of the subject has become highly complex and involved. It would be interesting, indeed, if the voice of Darwin could be heard to-day concerning the many questions which have arisen since his death, or upon which new light has been thrown by recent criticism and investigation. This being impossible, there is no man so pre-eminently qualified to speak for him as George J. Romanes. From personal contact and sympathy with his master, and from years of study in similar lines of investigation, he is probably more thoroughly imbued with Darwin's spirit than any other man living, and his attitude of viewing the biological problems of the day doubtless comes as near to the standpoint which Darwin himself would be expected to assume as is possible to imagine. His present work will consequently possess a double interest and value to those concerned with the literature of Darwinism.

The first volume of the series of three, the only one as yet before the public, is, as the author says in his preface, "likely to prove of more service to general readers than to professed naturalists," being "a systematic exposition of what may be termed the Darwinism of Darwin"; and yet many questions are raised, even in this first volume, in which scientists are greatly concerned. The book is very properly divided into two parts, the first being a demonstration of evolution as a fact, and the second a discussion of natural and sexual selection as more or less complete explanations of the fact. With the first part of the work naturalists are not so much concerned as the general public, for if there be any actual workers in scientific fields at the present day who are not convinced of the validity of evolution as a fact—as a description of the historical growth of organisms—there is no hope for them, and they are not worth wasting time with. With the general public, however, the case is

* Open Court Publishing Co., Chicago.

otherwise. Being unfamiliar with even a smattering of modern biological research, their attention has not been directed in these channels. Mr. Romanes, therefore, very properly considers that he has a public to convince, and argues every question from this standpoint. In criticising the first part of his book, consequently, the only thing to consider is how well and how forcibly, or, rather, from the standpoint of an outsider, how fairly he has presented the case of evolution. Had this work appeared even a comparatively short time ago there would doubtless have been many reviewers who would question the validity of his proofs, but to-day there are few who would have the temerity to openly attack such a demonstration and expose themselves to the criticism which would follow. It is really a question merely of whether his arguments are so presented and his illustrations so chosen that a person unfamiliar with the subject could reasonably be expected to follow him. And this, it seems, he has really succeeded admirably well in doing. The figured illustrations are especially worthy of notice, for both from their profuseness and the judiciousness with which they have been selected they, in many cases, speak for themselves.

After a few pages of introduction, in which the subject is discussed from a general point of view, the testimony of classification is adduced, followed in succession by that of morphology, embryology, palæontology and geographical distribution. In every case he argues with the defender of special creation and a designing deity, showing the innumerable inconsistencies and absurdities which the advocates of that view must maintain. Thus, in the chapter on geographical distribution, he shows that on islands where gales of wind are continually replenishing the mainland forms of life there are few distinct species, while on islands where high winds from the mainland do not prevail the species are, for the most part, distinct. "But," he says, "on the theory of special creation, it is impossible to understand why there should be any such correlation between the prevalence of gales and a comparative inertness of creative activity. And, as we have seen, it is equally impossible on this theory to understand why there should be a further correlation between the *degree* of peculiarity on the part of the isolated species and the *degree* in which their nearest allies on the mainland are there confined to narrow ranges, and therefore less likely to keep up any

biological communication with the islands."* The chapter on embryology is especially worthy of mention as probably the best and fullest argument for evolution ever made from this standpoint. It is noticeable that the general plan of Prof. Joseph Le Conte's work on Evolution and its Relation to Religious Thought has been followed in the first section of the work under discussion, although the illustrations and the method of presenting them are, to a large extent, unlike those of any other expounder of the subject.

I will not attempt to discuss a number of points which might be raised with regard to the second part of the book, reserving this for a future time. There is only one point which need be mentioned here. In the chapter on The Theory of Natural Selection, Mr. Romanes says:† "Next, it must be clearly understood that the life which it is the object, so to speak, of natural selection to preserve, is primarily the life of the species; not that of the individual. Natural selection preserves the life of the individual only in so far as this is conducive to that of the species. Whenever the life-interests of the individual clash with those of the species, that individual is sacrificed in favor of others who happen better to subserve the interests of the species." Why not go a step farther and say that it is the life of the genus, or the family, and not of the species, which natural selection preserves? Species or specific types count for nothing if they come into conflict with higher or better adapted specific types. The record of evolution is a history of the destruction of inferior species to make room for superior. But is it not in reality the individual, rather than the species, which natural selection preserves? I mean, of course, the best individuals. He cites as proof that natural selection works for the good of the species rather than the individual the case of the ant, "which will allow her head to be slowly drawn from her body rather than relinquish her hold upon a pupa." Let us examine this instance a little more in detail. There can be no doubt, apparently, that such an instinct as this does make for the good of the community and against the well-being of the individual concerned.

Suppose, however, this instinct of the ant which he cites had

* Pp. 230–231.

† Pp. 264-265.

not yet been developed. Then any individual ant which varied in its nature towards determination in facing an enemy would be a great benefit to the tribe, no doubt, but would it stand a better chance to survive and leave offspring who would perpetuate this tendency? On the contrary, it would be far more apt to be killed early in its career, for Mr. Romanes does not need to be reminded of the old proverb:

> "He who fights and runs away
> May live to fight another day."

If every individual who possessed this tendency towards self-sacrifice were to be killed off because, as an individual, it was less fit to survive, how could the species ever acquire this instinct? After any altruistic variation was well established it is easy to see how natural selection might favor the group of individuals possessing it, whether it be a mere isolated assemblage or an entire species, in their combined conflicts with other groups or species which did not work in harmony; but the difficulty is to understand how it could become established. The individuals would necessarily contend among themselves for superiority, and this contest would be a more immediate and vital one than the rivalry between allied species, or even different sections of the same species.

The American edition of this work is published in a very neat and attractive form. C.A.K.

The Contemporary Evolution of Man. By HENRY FAIRFIELD OSBORN.* In this, the first of the Cartwright Lectures for 1892, the author presents a general survey of the anatomical changes at present taking place in man, with the intention of investigating their bearing upon the question of the inheritance of acquired characters. Dr. Osborn believes that all the organs of the human body are in a state of change at the present time, although some are moving much more rapidly than others, either progressively or retrogressively. He proposes the term metatrophism for the "compensating readjustment, whereby the sum of nutrition to any region remains the same during redistribution to its parts." He considers that man is changing in structure as rapidly at the present time as the horse did in evolving from its five-toed ancestor. Variations in the skeleton, teeth and muscles are discussed in some detail. Under

* The Am. Nat. xxvi, 455–481.

the topic, The Limits of Reversion, the author calls attention to the fact that an abnormal organ or structure, even though it resembles some normal structure in a lower animal, is not necessarily a reversion, but may be a coincidence.

There is danger of forgetting the branching plan of evolution and jumping to the conclusion of a connection where none exists. In concluding, Dr. Osborn says: "There are clearly marked out several regions in the human body in which evolution is relatively most rapid, such as the lower portion of the chest, the upper cervicals, the shoulder girdle in its relation to the trunk, the lower portion of the arm and hand, the outer portion of the foot. We notice that these regions especially are centers of adaptation to new habits of life, in which new organs and new relations of parts are being acquired and old organs abandoned.

We observe, also, that all parts of the body are not equally variable, but these centers of evolution are also the chief centers of variability. The variations here are not exclusively, but mainly, of one kind; they rise from the constant struggle between adaptation and the force of heredity." C.A.K.

The Difficulties in the Heredity Theory. By HENRY FAIRFIELD OSBORN.* In the second Cartwright Lecture for 1892, Dr. Osborn discusses the bearing of the facts of human evolution enunciated in his previous lecture upon the inheritance of acquired characters. The generalizations in this paper are, for the most part, re-statements of his views upon this subject, in some cases from new points of view.

The history of the heredity theory is briefly outlined, and the effect of impacts and strains upon the mammalian foot and the wearing of cusps is again alluded to. The article concludes with some brief remarks on the inheritance of mutilations, the effects of previous fertilization, and maternal impressions. The author is inclined to believe in all three, and especially declares his acceptance of the influence of maternal impressions upon the young. The note upon the inheritance of mutilations of the tails of mice is of interest, but, as the author remarks, would need confirmation.

C.A.K.

* The Am. Nat. xxvi, 537-567.

Revision des Calanides d'eau douce is the title of a work recently published by the well-known zoologists JULES DE GUERNE and JULES RICHARD in the Memoires de la Société Zoologique de France, vol. ii, p. 53. In this work are found described by Prof. WIL. LILLJEBORG several species from California. The work is a most excellent one, and accompanied by numerous illustrations. The following are the species from California: *Diaptonus Eiseni, D. Franciscanus, D. siciloides, D. signicauda, D. Tyrrelli, D. Tryborni, D. oregonensis, Osphranticum labronectum, Epischura nevadensis.* Prof. W. Lilljeborg is now occupied with describing a l rger collection of fresh-water Copepoda and Astracoda, collected in California, and would be pleased to receive any additional specimens, in order that the account of this branch of California crustacea may be presented as fully as possible. G.E.

A New Generic Name for the Bering Sea Fur-seal. By T. S. PALMER. Proc. Biol. Soc. Wash. vii, 156. The genus *Callohrinus* is replaced by *Callotaria*, *Callirhinus* having been used in entomology and also in herpetology.

Description of a New Prairie Dog (Cynomys mexicanus) from Mexico. By Dr. C. HART MERRIAM. Proc. Biol. Soc. Wash. vii, 157–158. *Cynomys mexicanus* from La Ventura, Coahuila, Mex., collected by Mr. C. P. Streator.

The Auk for July, 1892, has a colored plate of the Rio Grande Turkey (*Meleagris gallopavo ellioti* Sennett). *A Study of the Sparrow Hawks (Subgenus Tinnunculus) of America, with Especial Reference to the Continental Species (Falco sparverius* Linn.) By EDGAR A. MEARNS. Beginning with a synopsis of the American species, the author notices the variations of plumage dependent upon age, sex and season. Descriptions are given of new subspecies: *Falco sparverius deserticolus*, Desert Sparrow Hawk, inhabiting "Southwestern United States, north to northern California and western Montana, south to Mazatlan in northwestern Mexico." *Falco sparverius peninsularis*, St. Lucas Sparrow Hawk, from Lower California. *Falco sparverius æquatorilis*, Ecuador Sparrow Hawk, from Ecuador, S. Am. Dr. Mearns's paper is based upon a study of 297 specimens, of which 241 are from North America north of Mexico. Enough phases were noticed to afford a basis for a number more subspecies, but the incipient forms have not been named.

In General Notes, Mr. R. H. Lawrence records the capture of two California jays near Vancouver, Washington, as the first record for that State. The occurrence there of the species is of interest, but was first noted by Nuttall, who met with them near Fort Vancouver.

Mr. T. S. Palmer adds four species to the list of birds of Gray's Harbor, Washington, published in the January number of the *Auk*, to which list a few dozen more additions are given by Mr. Hubbard in the present number of this journal. W. E. B.

The Humming Birds. By ROBERT RIDGWAY. Rep. Nat. Mus. 1890, 253-383, plates i-xlvi. To one having even the slightest inclination toward a love for birds to begin this volume is to read it through. Probably no single family of birds has received more attention from naturalists, nor admiration from all, than the humming birds, of which there are about five hundred recognized species and varieties entirely confined to the New World.

The work is virtually divided into two parts, the first treating of the general subject under divisions into topics. Early History. Names and their Origin. Geographical Distribution. Migrations. Habits. Abundance of Individuals. Actions and Attitudes. Manner of Flight. Disposition. Intelligence. Nests and Eggs, with which are given fourteen plates of illustrations, in black and white, principally after Gould. Voice. Food. Characters and Relationships, illustrated by an enlarged drawing, by Mr. Lucas, of the skeleton of *Trochilus colubris*, and by figures showing the pterylosis of a humming bird. Variations, treating of the size, bill, wing, tail, tail-coverts, are fully illustrated, there being seven plates of outlines of tails. Head Ornaments, etc. Colors of the Plumage, with nine plates illustrating fifteen species. Cause of the Changeable Hues of Humming Birds, closing with Brief Descriptions of some of the more Brilliantly Colored Kinds. Throughout the foregoing pages the technical name is mainly subordinated, and each topic is so fascinating that one wishes there were more of it, as well as of the humming bird verse which appears in appropriate places. The second part, as it may be conveniently termed, treats of the Humming Birds of the United States, illustrated by twelve plates representing thirteen species and twenty-three specimens, in black and white drawings. Subgeneric names have been used in place of

the generic names adopted by the A. O. U., and *Selasphorus floresii* in places instead of *Trochilus floresii* or *T. rubromitratus.* Analyses of species and full descriptions are given, as also a "key to the genera of humming bird occurring in the United States, Mexico, Cuba and the Bahamas," adapted from the author's "Manual of North American Birds." Opinions will differ regarding placing Anna's humming bird as the most beautiful of North American hummers; in California the popular vote would be cast for an adult male Allen's or rufous humming bird, excepting, of course, the straggler Floresi's humming bird. W.E.B.

Outlines of Zoology. By J. ARTHUR THOMSON, M.A., F.R.S.E. In this volume Prof. Thomson has presented the students of zoology with a very valuable general guide. It is essentially a book for beginners rather than for more advanced students, the ground covered being so extensive that no great attention to minute details is possible. The work is especially adapted to the requirements of the novice, from the fact that it is written in a very fascinating style and is clear and, for the most part, simple without any sacrifice of scientific accuracy. Nearly a hundred pages of introduction deal with questions of general and fundamental scientific interest—classification, physiology, cells and tissues, reproduction, heredity, geographical distribution, paleontology and evolution. This section is admirable for the terseness with which the ground is covered. As might be expected, the author lays some stress upon his own peculiar views with regard to metabolism, reproduction, etc., although these are in no wise unnecessarily obtruded. A noticeable innovation with regard to his classification is the inclusion of Balanoglossus and Cephalodiscus among the vertebrates. In giving his reasons for so doing he says that in these two forms "the vertebrate affinities are well marked, and we shall at least emphasize the fact that there are no hard and fast lines of division if we place these two types at the beginning of the chordate series."

The body of the work is occupied with a short account of each class in the animal series. After a table showing the general classification of a group is given a "survey of types," under such topics as general life, general structure, minute structures (forms of cells, etc.), reproductive organs and development. The structure of each group is represented by a rather rough but clear diagram.

A systematic classification giving the distinctive features of each class and order follows, the account closing with a few general remarks on the life and history of the group in question. Although dealing primarily with anatomy, the external form, habits and general classification of animals are by no means slighted. C.A.K.

Journal of Morphology, VI, 1–360. Vertebrate Cephalogenesis. II. A Contribution to the Morphology of the Vertebrate Ear, with a Reconsideration of its Functions. By HOWARD AYERS. In this work a lengthy and exceedingly important investigation of the embryology, morphology and physiology of the cordate ear is presented. The author has made an exhaustive examination of a great number of representative types, and, as a result, revolutionizes many of the generally accepted ideas, both of the development structure and functions of many of the parts of the ear. The work is illustrated with twelve plates and a number of diagrams and figures. Mr. Ayers concludes from his investigations that the vertebrate ear is not related phylogenetically to the invertebrate, but is formed by the union of two sense organs—the superficial canal complex. He finds a close connection between the ear of the alligator and of mammals, and considers that the organ of Corti of the latter is a direct descendent of the organ of Corti in the former. This modifies the position of birds in the scale, so far as the morphology of the ear is concerned. The author says: "Having found, from my own investigations, in three groups of birds — Rasores (Gallus), Columbinæ (Columba), and Passeres (Mimus)—that the development of the cochlea is not so far advanced as in the hydrosaurian reptilia, it will be necessary to change the view advocated by Hasse, according to which the saurian reptilia stand as transitional forms between the amphibia and the lower reptilia and the birds, for it is obvious that in cochlear anatomy the birds hold a place apart from the direct line of descent as typified in the mammalian cochlea." *

Mr. Ayers' generalizations with regard to the development of the ear are of great importance. "Although *ontogenetic* evidence," he says, † "seems to lead to the conclusion that the auditory organ arose by the invagination of a *single superficial sense organ*, it is by no means certain that this is true, for there are certain facts of comparative anatomy and certain phylogenetic considerations which

* P. 227. † P. 231.

point to the conclusion that the auditory organ has arisen by the bringing together of two originally distinct sense organs which were together sunk below the surface." He then gives the evidence for this, which is mainly the distinct origin of the nerve roots which supply the ear. He accordingly considers the membranous labyrinth as a vestigial structure, and prophecies that in the future ear little will be left save the cochlea. Among the points in morphology which he has discovered the following are of general interest: the hair-bearing cells of the cochlea are probably never double, as was formerly supposed; the sense organs on the floor of the cochlea consist of a series of linear fibres closely united together, and are not a single band-like sensory apparatus, as described by previous investigators; the basilar membrane does not possess sufficient elasticity "to serve for the transmission of the delicate undulations which it has been supposed to transmit, and from its composition a great deal of the motion imparted to it would necessarily be lost in transmission;" "the evidence of comparative anatomy is entirely against the existence of the spiral nerve bands;" "the ear is supplied by two distinct nerves which have widely different origins in the brain, and are, in reality, *branches from two nerves*, and so not a discrete cranial nerve, as has formerly been supposed to be the case;" "the so called membrana tectoria of previous authors is, in reality, a hair-band or field of long, slender hairs which spring from the tops of the hair cells and form a waving plume on the crest of the ridge of the organ of Corti;" "the membrana tectoria, the membrana reticularis, Loewenberg's net, and the three or four main trunks of the system of spiral nerves of the cochlea have no existence as such in the living mammalian ear."

The physiological results of Mr. Ayers' investigations are of equal importance with the morphological. He details experiments conclusively proving that the semicircular canals are not indispensable for the equilibration of an animal, which function he very reasonably considers to be exercised by all the nerves of sense in general. He may, however, be a trifle hasty in assuming that the semicircular canals are without any function whatever. He considers "the outer and middle ear to be mere accessory structures acquired by the higher vertebrates in ever-increasing complexity, for the sole purpose of enabling the animal to preserve in the aërial ocean, on or near the bottom of which they live, the necessary

aquatic conditions in which they were born (phylogenetically), and which they must preserve or lose their auditory organ completely." He believes that the cochlear organs alone are enabled to perceive all kinds of sound. The sound waves institute a responsive vibration in all or nearly all the filaments, in succession, of the hair-band of the organ of Corti, according to Mr. Ayers. "Timbre, or the tonal color of sounds, is due to a combination of the stimuli or the effects of the excitation of a series of vibrations of which the main or fundamental tone is most prominent, while the other vibrational impulses make themselves felt as 'coloring' of this base. The combination is a psychical phenomenon, and there is no combined result of simultaneous sympathetic vibrations transmitted from the ear; on the contrary, each vibrational impulse is transmitted to the brain at its full value, and its effect in audition is due entirely to psychical processes." C.A.K.

Psyche, February, 1892, contains a contribution on the "Blood-tissue" of the insecta by WILLIAM M. WHEELER, continued in the March and April numbers. The papers give evidence of very careful and thorough work in a comparatively unworked field.

C.A.K.

The Nature of the Shoulder Girdle and Clavicular Arch in Sauropterygia. By H. G. SEELEY. Proc. Roy. Soc. LI, pp. 119–151. A comprehensive investigation of the clavicular arch in Plesiosauridæ and Elasmosauridæ, with a scheme of classification for the two groups. In discussing the classification, the author cites facts illustrative of Cope's law of parallelism. He says: "And it is remarkable that many Liassic species have the articular faces of the vertebral centra deeply biconcave, while in many Cretaceous species those surfaces are nearly or quite flat; in the shoulder girdle nothing but continued ossification, apparently, is needed to convert the Liassic Plesiosaurian into the Oolitic and Cretaceous Elasmosaurian type. *Eretmosaurus* is the nearest approach to this type known from the Lias.

It thus appears as though some animals complete their embryology early in life, others at intervals during life, while in most types the embryonic development takes place gradually during successive epochs of geological time, giving rise to classification of its stages, indicated as genera, families, orders; and, therefore, that the young individuals of a late period of time simulate genera of an earlier age." C.A.K.

PROCEEDINGS OF SOCIETIES.

California Academy of Sciences. *May 2, 1892.* President Harkness in the chair.

The Librarian reported 185 additions to the library.

Dr. H. H. Behr read a paper on the Flight of Insects.

Dr. Harkness exhibited gall-wasps just hatched from leaf-bud galls of the oak.

June 6, 1892. President Harkness in the chair.

Accessions of fossil and recent shells were reported from Mrs. M. Burton Williamson, Miss McVenn, W. J. Raymond, T. S. Brandegee, Dr. C. L. Anderson, Dr. Dozier, F. Engles, Henry Hemphill, Gustav Eisen, R. Reid, Dr. S. Bowers.

Two hundred and ninety additions to the library were reported.

The President announced the death of J. J. Rey, L. L. Robinson and S. M. Wilson, life members, and of Prof. E. Regel, honorary member.

Dr. Gustav Eisen made a preliminary report on the expedition to Lower California.

June 20, 1892. President Harkness in the chair.

Dr. Gustav Eisen read a paper on the Lost Civilization of the Mayas as Indicated by Archæological Remains in Mexico and Central America, illustrated by stereopticon views.

July 18, 1892. President Harkness in the chair.

The Librarian reported 440 additions to the library.

Mr. S. W. Holladay read a paper on Earthquake Freaks.

Charles A. Keeler gave an account of his recent trip to the Farallon Islands, and exhibited a portion of the collections made on the trip.

California Botanical Club. *May 16, 1892.* President Campbell in the chair.

The following were elected to membership: Mrs. Austin Sperry, Adolph Sutro, E. J. Molera, Miss Louise Bundschu, F. N. Notes-lein, Mrs. M. A. Wills, Miss Clara Rice, Mrs. C. E. Miller, Mrs. F. Butler, Mrs. Edward Probert, Theodor Holm, Alfred J. McClatchie.

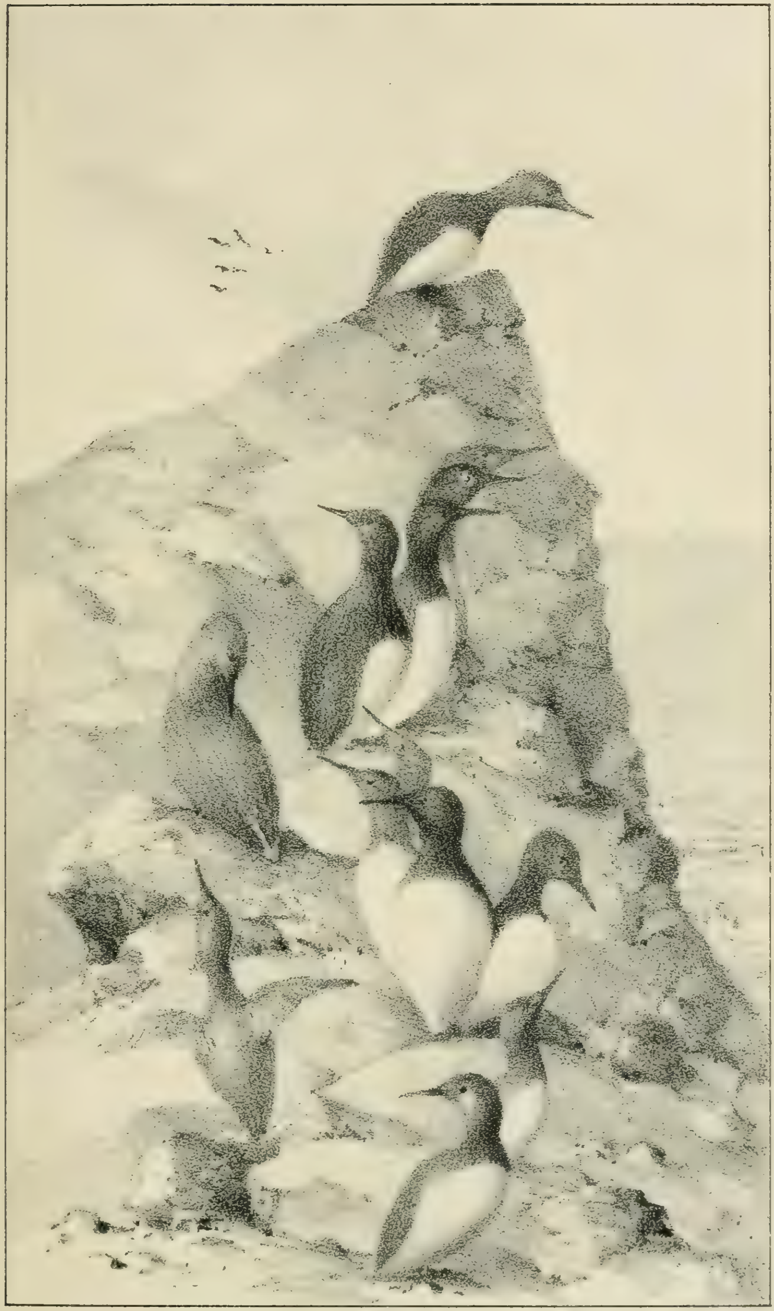
Prof. D. H. Campbell delivered a lecture on Ferns and their Relations, explaining their affinities as shown by the later researches into their structure, and the details of their reproduction as com-

pared with that of their allies. The audience were enabled to inspect specimens of most of the plants under consideration.

July 11, 1892. Mrs. Brandegee in the chair.

The following were elected to membership: A. W. Robinson, Mrs. M. E. P. Ames, Miss Aphra Rogers, Miss Mae F. Dority, Robert L. Toplitz, Mrs. R. L. Toplitz, Mrs. E. J. Corbett, H. S. Durden.

California Zoological Club. During April and May the California Zoological Club, under the auspices of the California Academy of Sciences, gave a course of popular lectures on zoology, illustrated with stereopticon views. The lectures were delivered by Charles A. Keeler, as follows: 1. Creation of Law—a popular exposition of the doctrine of evolution, April 21. 2. Fundamental Groups of Animals—an explanation of the principles of classification and illustrations of the leading types in zoology, April 28. 3. The Mammalia—illustrated by about 80 views of representative species, May 5. 4. The Mammals of California—illustrated with stereopticon views and prepared specimens, May 12. 5. The Bird, May 19. 6. Song Birds of California, May 26.

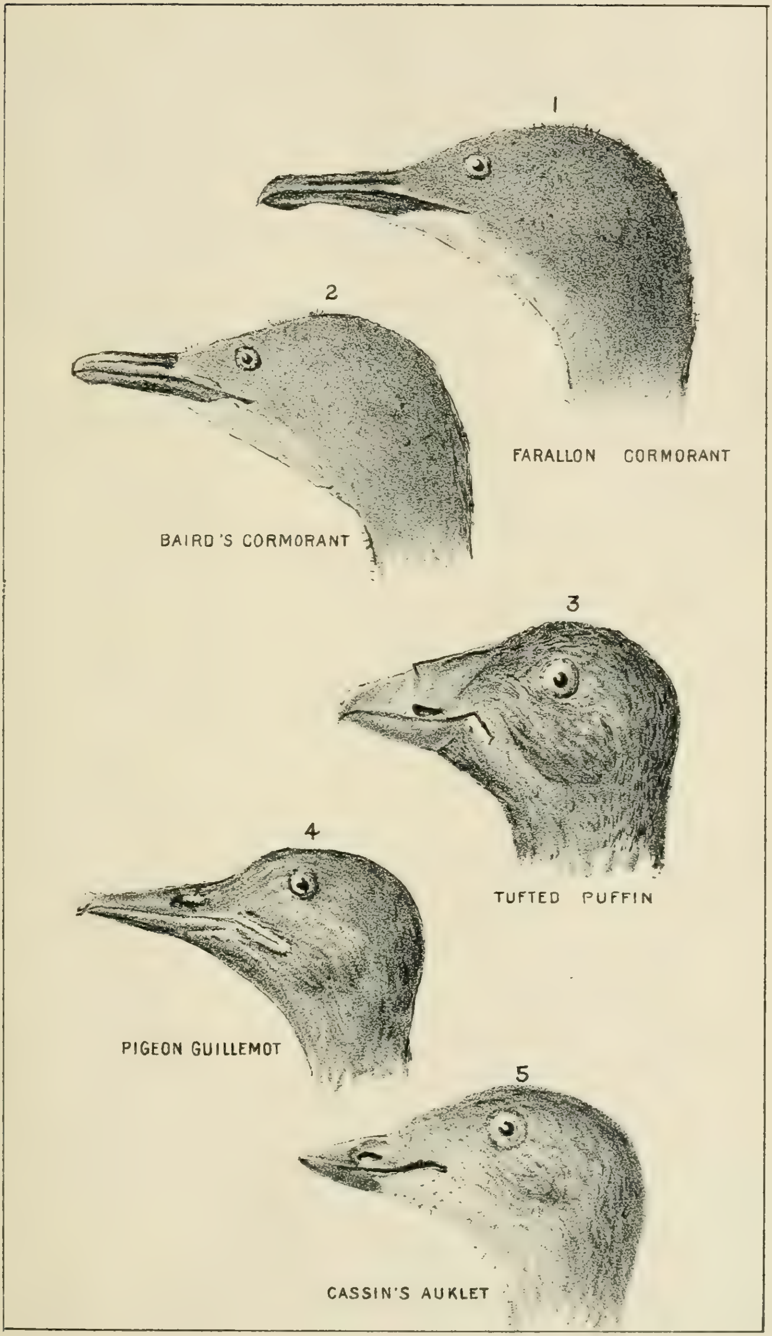


C.A.K.Del.et.Sc.

CALIFORNIA GUILLEMOT

FARALLON CORMORANT

PIGEON GUILLEMOT


1
2
FARALLON CORMORANT
BAIRD'S CORMORANT
3
TUFTED PUFFIN
4
PIGEON GUILLEMOT
5
CASSIN'S AUKLET

C.A.K. Del. et. Sc.

ZOE

A BIOLOGICAL JOURNAL.

VOL. III. OCTOBER, 1892. No. 3.

BALANOGLOSSUS AS ONE OF THE GENERALIZED TYPES IN ZOOLOGY.*

With Plate xxii.

BY WILLIAM E. RITTER.

During the summer of 1890, it was my good fortune to be able to spend the vacation studying in Alexander Agassiz's Marine Laboratory at Newport, R. I. While there I became greatly interested in Balanoglossus and its larva, and collected considerable material for its study, and the original drawings here presented were made at that time.

I take this opportunity to call the attention of our Pacific Coast zoologists to this remarkable animal more particularly than the zoological text-books and the special papers treating of it would be likely to do, the desire being to hasten the bringing of the creature to light if it exist on these shores. At the same time, however, I will add a few observations and reflections of my own, that may not be altogether without interest to those who have made a detailed study of the animal. Since Kowalevski[1] published the results of his investigations on the development of the simple Ascidians in 1866, and there pointed out their relationship to the Vertebrates, no animal has been brought into court that has given such weighty testimony against the reality of a definite and hard fixed line separating Vertebrates from Invertebrates, such as was supposed by the older zoologists, as has this same wormlike Balanoglossus.

The credit of having first recognized the true nature of the animal

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* Modified from a paper read before the California Zoological Club, San Francisco, March 26, 1892.

[1] A. Kowalevski, Entwickelungsgeschichte der einfachen Ascidien. Mém. Acad. Imp. Sci., St. P., viie sér. T. x, No. 15, 1866.

belongs to Mr. William Bateson,[2] a young English morphologist, who studied the structure and development of an American species found on our Atlantic coast; though it is an interesting fact that the distinguished Russian already mentioned was the first to study in detail the structure of the adult, he having published the results of his investigations on this subject in the same year that his classical Ascidian paper, mentioned above, appeared.

We will give a short account of the structure, development, and habits of the animal, and also consider briefly its claims to the right of being raised from the ranks of the "lowly worm" to a place among the nobler Chordata, which promotion was proposed by Mr. Bateson, and has been adopted by several more recent writers.

By the aid of Figs. 1 and 2 we may be able to get a fairly good idea of the appearance and anatomy of the adult animal. The original figure, here copied from Korschelt & Heider,[3] was made by Alexander Agassiz and represents the Atlantic coast species, *B. Kowalevskii.* The creature is divided into three very distinct regions: the proboscis, *pro.*; the collar, *col.*, and the abdomen, *abd.*, which is again composed of a pharyngeal or respiratory portion, and an abdomen proper or digestive portion. The proboscis is a firm muscular organ, cylindrical or somewhat conical in shape, but varying considerably both in form and length in different species; in most species it is, however, proportionally shorter than in the one here represented. The proboscis is joined to the collar by a short peduncle. In its normal condition the collar is nearly cylindrical in shape, and, as with the proboscis, there is nothing either in form, surface marking, or color, to readily distinguish the dorsal from the ventral side. The mouth is ventrally situated, but its position at the anterior end of the collar at the point of attachment of the peduncle to this latter is so effectually shut in by a sort of rim-like projection on the anterior edge of the collar that it is scarcely visible, particularly when the parts are in a state of contraction.

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[2] Wm. Bateson. The Early Stages in the Development of Balanoglossus (sp. incert). Quart. Journ. Micro. Sci., Vol. xxiv, Apr., 1884. Also: Continued Account of the Later Stages in the Development of Balanoglossus Kowalevskii, and of the Morphology of the Enteropneusta, ibid Vol. xxvi, p. 511, 1886. Also: The Ancestry of the Chordata, ibid Vol. xxvi, p. 535, 1886.

[3] E. Korschelt und K. Heider, Lehrbuch der vergleichenden Entwicklungsgeschichte der wirbellosen Thiere, erstes Heft, Jena, 1890.

The abdomen is several times longer than the other two parts combined and is very distensible. It is soft and frail and one rarely sees it whole, so easily does it break as the animal is being extracted from its tube in the soft mud or sand in which it lives.

The surface of this region is much less regular than that of the other two parts previously described, it being, particularly in its anterior, pharnygeal portion, somewhat quadrilateral with irregular transverse folds affecting particularly the dorsal angles. As seen by the figure the gills, *gi.*, are arranged in a double series on the dorsal side of the animal, each series, as seen from the surface, being composed of a large number of crescentic openings.

The sexual orifices are also found in this region, but are very minute, *s. or.* The three portions of the animal differ from one another in color. The proboscis is a uniform very light yellow, the collar is also yellow but of a considerably more pronounced shade. The abdomen is of a brownish tint marked with darker spots, and for a portion of its length has a greenish shade from the presence of the liver within showing through the body wall. In size the creature may reach a length of eight inches in some of the larger species. It will be noticed from this description that the animal is entirely without paired appendages, either for locomotion, prehension, or sensation. Its only organ of movement is its proboscis.

The animal is entirely marine, so far as known, and is confined to shallow water near shore, and as already said, lives buried in mud or sand. The species found on the New England coast can be collected at low tide only, when the earth in which it lives is uncovered. It is usually found about a foot or two below the surface, and one readily determines where to dig for it by the very characteristic spirally coiled cast of sand and mud at the opening of its tube that has been ejected by the animal within.

As it is in the creature's role as a candidate for a place among the chordata that it has become chiefly distinguished in recent years, the attention that we here give to its anatomy may profitably be from the standpoint of a comparison with the fundamental chordate structure. In this way the points of agreement may be brought out with emphasis, and at the same time the points of disagreement may be made equally emphatic.

Bateson, who, as already said, was the first to carry out this comparison in detail, points out three primary and four secondary par-

ticulars in which its structure and development resemble the typical chordate. These are as follows: Of the first class, (1) the position and origin of the central nervous system; (2) the possession of a notochord; (3) the possession, method of origin and arrangement of gill-slits. Of the second class, (1) the origin of the mesoblast—the middle germ layer; (2) the asymmetry of the anterior parts; (3) the opercular fold; (4) the excretory funnels opening into the atrial cavity. It must serve our present purpose to consider the three primary features here enumerated; the secondary ones must be passed by with some general statements, merely.

All vertebrates are characterized by the possession, at least in embryonic life, of a notochord arising from the dorsal portion of the primitive digestive tract, and extending parallel with the long axis of the animal; by the possession of a cerebro-spinal nerve axis that arises from the ectoderm of the dorsal portion of the embryo, and extends parallel with the notochord along its dorsal side; by the possession of paired respiratory organs that arise from the anterior portion of the digestive tube and communicate with the external world, either through the mouth or independently of it; and by the possession of a large median dorsal blood vessel situated between the digestive tract and the notochord, in which the blood flow from before backward.

To all these fundamental features Balanoglossus certainly presents some remarkable resemblances. The nerve cord arises from the dorsal portion of the ectoderm of the embryo by a process that is quite similar to that by which the same structure arises in many of the fishes, as the lamprey and the bony fishes. However, certain important differences must not be disregarded.

In all vertebrates the posterior end of the medullary plate—the nerve cord in its early stage—terminates at the blastopore, while in Balanoglossus, it does not extend so far back; in fact the portion of it that seems most nearly to resemble the vertebrate cord is apparently confined to the collar, while the anus is situated at the extreme posterior end of the animal. Furthermore it seems quite doubtful if the canal, or space that finally appears in the cord of Balanoglossus, is in any sense morphologically comparable to the vertebrate neural canal.

Again, it is to be observed that in all vertebrates, even including Amphioxus, the nerve cord is encased in a connective-tissue or

cartilaginous sheath, which is directly continous with a corresponding sheath surrounding the notochord, while in Balanoglossus no such sheath is found, the nerve cord and notochord not only not being in close relation, but the dorsal blood vessel is situated between them. However, so far as the absence of the sheath is concerned, the difficulty is hardly a weighty one since we must suppose, both from developmental evidence and on *a priori* grounds, that the earliest vertebrate ancestors were without such a sheath. But the situation of the dorsal blood vessel as described is not so easily explained away, though Dr. Morgan[4] has suggested that the dorsal aorta of vertebrates is another vessel entirely. His suggestion would seem to imply that in vertebrates the dorsal aorta has arisen since the vertebrate phylum branched off from the common ancestral form, and that the dorsal vessel corresponding to the one now found in Balanoglossus has disappeared. This conjecture may receive support from the fact that the heart of Balanoglossus is situated in the proboscis, and hence cannot certainly have any relation to the vertebrate heart.

In this connection it seems to me worth while to refer to the lymph canals described by Lankester[5] within the notochordal sheath, one on the dorsal side and one on the ventral side, in Amphioxus. And the same author speaks of the great difficulty in distinguishing blood vessels from lymph vessels in this animal. It would be rash to maintain a homology between the lymph canal in the dorsal portion of the Amphioxus notochord and the dorsal blood vessel of Balanoglossus, yet no harm can come from a cautious suggestion of such a possibility.

The notochord of Balanoglossus originates from the dorsal wall of the digestive tube as it does in vertebrates, and in later stages of development resembles the vertebrate notochord in its histological structure considerably, thus satisfying two of the important criteria of homologous structures. But, in all vertebrates, without exception, the notochord arises from nearly or quite the entire length of the embryonic digestive tube, while in Balanoglossus it arises as an evagination from near the anterior end and grows out anteriorly

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[4] T. H. Morgan. Growth and Metamorphosis of Tornaria, Journ. of Morphology, Vol. v, p. 407, 1892.

[5] E. Ray Lankester. Contributions to the knowledge of Amphioxus lanceolatus, Yarrell, Quart. Journ. Micro. Sci., Vol. xxix, p. 365, 1889.

in the form of a pouch extending through the peduncle somewhat into the base of the proboscis. Its connection with the digestive tube never becomes severed as it does in all vertebrates.

It appears to me that it is in the "branchial basket" and the parts immediately associated with it that we find the most convincing evidence of genetic relationship between Balanoglossus and vertebrates. In this particular greater similarity exists between Balanoglossus and Amphioxus, than between the Cyclostome fishes and higher fishes. And the resemblance is the more convincing because of the complexity of structure—the large number of points presented for comparison in the two cases. A detailed description and comparison of all these points is quite out of the question in the present connection. I may mention some of them, however, and refer those who may desire to examine the subject more carefully to the papers of Agassiz,[6] Spengel,[7] Bateson,[8] Lankester,[9] Morgan,[10] Willey,[11] and others. These are: the method of origin of the primary gill slits in the two cases, and the way in which these are each divided into two in later life by the so-called tongue bars; the very large and somewhat variable number of gill slits, as compared with all vertebrates, and the fact that the number increases till a late period in the developmental history of the animal; the similarity of the chitinoid bars that serve as a framework for the gill slits in the two cases; the beginning, so to speak, in Balanoglossus, of what would correspond, both in origin and in morphological relations, were the development carried further, to the atrium of Amphioxus; and finally, but by no means least in possible significance, the collar funnels in Balanoglossus comparable to the atrio-cœlomic funnels in Amphioxus. These latter structures

[6] Alexander Agassiz. The History of Balanoglossus and Tornaria. Mem. Amer. Acad. Arts and Sci., Vol. ix, 1867.

[7] J. W. Spengel. Ueber den Bau und der Entwicklung des Balanoglossus. Amtl. Ber. der 50 Vers. deutsche Naturf. u. Aertze in München, 1877.

Also: Zur Anatomie des Balanoglossus. Mittheil. aus der Zool. Stat. Neapel, Bd. v, 1884.

[8] l. c.

[9] l. c.

[10] l. c.

[11] Arthur Willey. Later Larval Development of Amphioxus, Quart. Journn. Mic. Sci., Vol. xxxii, 1892.

are probably in no wise connected, functionally, with the branchial apparatus (certainly not in Balanoglossus); but since structurally they are, and since we have no sure knowledge of what their function is, we may well enumerate them along with the structures in immediate connection with the branchial apparatus.

Now, having spoken briefly of the parts in the organization of Balanoglossus that do present strong resemblances to the corresponding parts in Amphioxus, we must turn our attention to those which do not.

The proboscis, which is so characteristic of the animal, not only cannot be compared with any structure in vertebrates, but the organs which it contains, viz.: the "proboscis gland," the heart, and the pore by which its cavity communicates with the exterior, are wholly unrepresented in any vertebrate. Likewise none of the portions of the abdomen lying behind the gill region can hardly be compared with anything found in vertebrates.

The structure of the body walls in the two animals is totally different. In Balanoglossus it is derived largely from the ectoderm, the muscular portion derived from the mesoderm being comparatively weak and small, showing nothing of the muscle plates so well developed in Amphioxus. Still it must be admitted that this conspicuous difference is rather secondary than fundamental since the origin of the mesoblastic pouches presents considerable resemblance in the two cases.

On the whole, then, it seems to me that by a careful weighing of all the evidence now at hand we are compelled to place this animal in our classification nearer the vertebrates than to any other group of animals (its comparison in several points with a remarkable creature brought from the depths of the ocean by the Challenger dredgings appears to be well founded. Unfortunately, however, all our knowledge of this animal rests upon the adult structure of a single species only and of a few individuals, even, of this one).

Strongly beliving in the affinities of the larva of Balanoglossus with the Echinoderm larva, Metschnikoff,[12] in 1881, attempted to follow out the logical consequences of this belief and to reduce the structure of the adult Echinoderm and Balanoglossus to a common fundamental type. The basal feature for this comparison is the

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[12] E. Metschnikoff. Ueber die systematische Stellung von Balanoglossus, Zool. Anz., Bd. iv, 1881.

water system in the two groups, the proboscis of Balanoglossus being supposed to represent a single ambulacral tentacle of an Echinoderm. This is certainly a most ingenious speculation and one that must be admitted to be not wholly without plausibility, especially as regards this particular structure. The resemblance in other points of structure is very obscure, and it should be remembered that similarity between groups in several fundamental points of structure increases the probability of homology between these structures—and so of genetic relationship between the animals possessing them—many times beyond the number of points of resemblance. For example, we can see no *a priori* reason, either physiological or morphological, why a water system should not exist in correlation with several styles of animal organization. Consequently, when we find an animal possessing it that in other respects resembles other animals that possess it very obscurely if at all, the probability that the system is homologous in the two instances is not very great, it seems to me; at any rate there is great room for the possibility of analogy merely, i. e., that the structure has had an independent origin in the two cases. When, however, there is an essential agreement in several points of organization, as we have seen to be the case between Balanoglossus and vertebrates, the probabilities of mere analogy or independent origin are many times less.

Developmentally Balanoglossus presents some most interesting chapters in phyologenitic history—interesting both on account of the parts of them that we can understand, and of those that we cannot, as yet satisfactorily interpret. One of the most strikingly interesting things in this history is that the different species do not tell the same story, that they do not all present the same pedigree, and this is true, notwithstanding the fact that they are all so closely related that no one has ever pretended to claim more than specific differences between them.

So far as is known all the species excepting one pass through a very distinct and quite prolonged larval stage. This one—an American form — develops without any larval stage. The larva was discovered by the distinguished German zoologist, Johannes Müller,[13] in 1848. He was at this time studying the em-

[13] Johannes Müller. Ueber die Larven und die Metamorphose der Echinodermen, Zweite Abhandlung, Abhandl. d. Akad. d. Wiss. zu Berlin, Juli, 1848.

bryology of Echinoderms, and among the larvæ of the various groups of these animals that he collected with his tow net in the Mediterranean Sea was this which he named Tornaria from the fact that it constantly rotates about its long axis as it progresses through the water. He thought it was probably the larva of some Echinoderm and finally, after studying as many stages as he was ever able to find, decided it to be a Holothurian. Afterward several zoologists collected and described the same larva and were deceived as its original discoverer had been till finally, in 1869, Metschnikoff,[14] a Russian zoologist, was fortunate enough to see the Tornaria so far transformed into the Balanoglossus as to be able to recognize its true nature. The adult Balanoglossus had been well known for a long time. But although it was now soon established beyond a doubt that Tornaria is the larva of Balanoglossus and not of an Echinoderm its close resemblance to the larva of the latter, particularly to Auricularia, the larva of the Holothurian, was recognized by all who studied it. And I may here add that the advance of knowledge of both the Echinoderm larva and of Tornaria, even to the present moment, has only served to increase the belief in the minds of many morphologists that there is an actual genetic relationship between the two forms.

Figures 4, 5, 6 and 7 represent the Tornaria in several stages of its development. Figure 7 represents as early a stage as has ever been seen, the larvæ having always been captured after they have escaped from the egg and betaken themselves to their free swimming life. They are very transparent and at this stage very small, the specimen here figured being between .2 and .3 of a millimeter in length—barely large enough to be visible to the unaided eye, excepting it be accustomed to seeking such objects. From its extreme transparency the internal organs can be easily seen in the living animal.

On the surface are several thickened bands bearing cilia. In the smallest larvæ the course of these bands is comparatively simple, as is shown in Fig. 7, *c. b.* Were the opposite side of the larva to be seen, two more bands would be found in corresponding positions.

[14] E. Metschnikoff. Untersuchungen über die Metamorphose einiger Seethiere. 1. Ueber Tornaria. Zeitschr. f. Wiss. Zool., Bd. xx, 1870.

The four all unite at the apex of the anterior end of the larva, *a. p.;* and since the two short ones are continuous at their other ends by a cross-band in front of the mouth as are also the two longer ones by a similar band behind the mouth, the whole four form in reality a single band at this stage. At a little older stage these bands become much more complicated by being separated at the apex, and by taking on several loops in their course. The details of this need not be entered into, but a general idea of it can be gathered from Fig. 6, *c. b.* Moreover, an entirely new band appears, also ciliated, the cilia here being considerably longer than those of the other bands. This one passes around the anal end of the larva in the form of a girdle, and this form it never changes as long as it exists, viz.: throughout the larval life, Figs. 5 and 6, *c. c. b.* At the apex of the larva, at the point to which the longitudinal bands converge, is found a thickened spot in the ectoderm, supposed to be nervous; and in the center of this is a pair of pigmented eye-spots, *a. p.* and *e. s.* of the figures.

At the stage represented by Fig. 7, the only internal organs are the digestive tube consisting of an œsophagus, *œ.*, a stomach, *s.*, and a short intestine, *i.*, the mouth being placed at *m.*, and the anus at *a*, at the posterior end of the body; and the very small beginning of the "water vascular system," as it was originally called from its supposed identity with that organ in the Echinoderm larva. This is a single sac placed on the dorsal surface of the œsophagus, probably, however, not connected with it, even at this early stage. Its cavity communicates with the exterior by a tube, *c. t.*, the pore of which is on the dorsal side of the larva slightly to the left of the median line, *d. p.* A thread-like muscle band passes down from the apical plate to the sac *mu.*

Without attempting to follow the steps of development, we may pass to the condition that is presented by a larva just previous to its transformation into the Balanoglossus. Such a stage is shown by Fig. 4. The new organs that have appeared in addition to those already described are the so-called proboscis glands, *p. b.*, the mesoblastic pouches, *m. p.* [Fig. 5], the heart, *h.*, and three pairs of gills, *g.* The exact origin of the proboscis gland—or vesicle as it is sometimes called—is not known, neither is its function known, though in the adult animal it is thought by some to be an excretory organ, while others have called it an accessory gill.

The mesoblastic pouches have arisen as two paired evaginations from the lateral walls of the digestive tract. These four pouches become entirely severed from their original connection, and form large thin walled, entirely closed bags. They become so large in fact that each pair almost entirely surrounds the digestive tube, their inner walls being in contact with this latter while their outer walls are in contact with the inner surface of the ectoderm. In short, they form the real body cavity, or cœlom. The heart is a peculiar structure. It is said to arise as a space, merely, between the water vesicle and the proboscis gland. The walls of these two latter organs become closely pressed against each other, the contact being interrupted in a small area only, and this is the heart which becomes filled with a fluid in which there are no cellular elements. This makes the walls of the heart to consist of parts of the walls of two other organs, and this means that if each of these has a function of its own the tissue of the heart has a triple office, viz.: the portion forming a part of the wall of the water vesicle functions in that capacity; the portion belonging to the proboscis gland performs its office there, and finally the two parts together perform the functions of a heart. The organ can be very distinctly seen in the living larva when placed on its side and flattened down somewhat with a compressor (Fig. 4 is drawn from such a preparation). The walls are very distinct, and the contractions constant and regular. It should be pointed out, however, that the contractions are of quite a different character from what is seen in the hearts of most other animals. It does not consist either in a uniform, simultaneous contraction of the entire wall, as one sees take place, for instance, in the spherical vascular organs on the sides of certain marine leeches; or of a wave of contraction passing from one end to the other, the contraction affecting the entire circumference at each successive point passed over by the wave, as takes place in peristaltic movement, or as is seen in the heart of Ascidians, for example. But one-half of the wall does not contract at all, while in the other half a sharp fold sink deep into the cavity of the organ and travels across it, the edge of the fold not extending across, however, to the opposite wall.

The gills have arisen as paired pouches from the dorsal wall of the œsophagus, the anterior pair appearing first and the others in succession behind them. They do not fuse with the ectoderm and

break through to communicate with the outside world as in the adult animal, till a later period, after the metamorphosis has begun. While these new organs have been developing the old ones have been increasing in size and form. The water vesicle has elongated lengthwise of the animal; its walls have thickened in some regions, and as seen in Fig. 4, at X, a pair of horn-like processes now extend downward and a little backward, straddling the œsophagus. I would call particular attention to these because they have been seen and figured by Fewkes,[15] but their existence has been denied by Morgan.[16]

The changes that take place during the metamorphosis can here be touched upon only in the briefest way. The Tornaria loses its transparency, largely; gives up its free swimming career and settles down to the bottom of the vessel in which it is contained; its cilia disappear, and with them the thickened bands on which they are situated; the whole larva elongates, the anterior portion to become the proboscis, and the region behind the circular band of cilia to become the abdomen. The gills, which in the Tornaria are far forward, are brought to the position in which they are found in the adult, viz.: behind the collar, by the drawing backward of the stomach and œsophagus during the transformation. Figure 3 represents a young Balanoglossus about as far advanced as has yet been obtained by keeping them in confinement. The transformation to this stage takes place quite rapidly when once it sets in, but beyond this it seems to proceed very slowly. In fact, in the artificial conditions of the aquarium the little animal seems determined not to develop much further.

As already said, in the species the development of which was studied by Mr. Bateson, there is no Tornaria stage. It is in this species only that the method of cleavage and formation of the blastula and gastrula are known. In these early stages the processes are very similar to those which take place in Amphioxus and the Tunicates.

The very interesting question at once arises—it being remembered that the adults of all species are so nearly alike as to have never

[15] J. W. Fewkes. On the Development of Certain Worm Larvæ. Bull. Mus. Comp. Zool., Harvard University, Vol. xi, 1883.

[16] l. c.

raised a doubt that all belong to one genus—which is the more primitive way of development, directly without the larval stage, or through the larva? Did the first Balanoglossus reach its developmental goal by the long, indirect tornaria road, and did a more modern one, imbued with the rapid transit idea, cut across lots leaving the ancient roundabout way? Or did the older forms go across while the younger ones have taken to the longer road? No one has discussed this question at any length, and I am not going to undertake it at present. In fact without a knowledge of the first stages of development of the Tornaria, it would probably be impossible to arrive at any very satisfactory conclusion on the subject. It is suggested by Korschelt & Heider[17] that the direct development is the more primitive, their reason for this conclusion being found in the fact that the mouth and anus do not form in this larva till a comparatively late stage—a condition which would seem to be incompatible with a free swimming of larva.

There are, however, some quite serious difficulties in the way of this suggestion, one of which is that the circumanal ciliated band appears very early in the directly developing species, while it forms quite late in the Tornaria.

For the solution of this question, as well as of several others, it is of the utmost importance that we fill up the gap that now exists in our knowledge of the earliest embryonic stages of Tornaria; and to this end the more species we have access to, the better become our chances of being able to do this. It is quite probable that somewhere on our great extent of sand and mud beach a representative of the genus will be found.

EXPLANATION OF THE FIGURES OF PLATE XXII.

Fig. 1. Balanoglossus kowalevskii. (After A. Agassiz, from Korschelt and Heider.)

Fig. 2. Sagittal longitudinal section through the proboscis and collar of Balanoglossus sarniensis. (After Köhler, from Korschelt and Heider.)

Fig. 3. The young Balanoglossus, shortly after its transformation; under the compressor.

Fig. 4. The anterior portions of a Tornaria shortly before its transformation to Balanoglossus. The larva was flattened down somewhat by the compressor. The outlines drawn with a camera lucida.

Fig. 5. A Tornaria at a somewhat older stage than Fig. 6, to show internal structures.

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[17] l. c.

Fig. 6. The youngest stage of Tornaria yet seen. Actual size between .2 mm. and .3 mm.

Fig. 7. Surface view of Tornaria considerably older than the one shown in the following figure, to show the tortuous course of the ciliary bands.

Figures 3, 4, 5, 6 and 7 were all drawn by the writer from the living animals, at Newport, R. I., 1890.

ABBREVIATIONS USED IN THE FIGURES.

a.	Anus.	*h.*	Heart.
abd.	Abdomen.	*i.*	Intestine.
a. p.	Apical plate.	*m.*	Mouth.
c. b.	Ciliated band.	*mu.*	Muscle band.
ch.	Notochord.	*m. p.*	Mesoblastic pouches.
col.	Collar.	*n.*	Nerve cord.
c. t.	Tube of water system.	*œ.*	Œsophagus.
d. b.	Dorsal blood vessel.	*pro.*	Proboscis.
d. p	Dorsal pore.	*p. b.*	Proboscis gland.
e. s.	Eye spot.	*s. or.*	Sexual orifices.
g.	Gills.	*v. b.*	Ventral blood vessel.

RELICS FROM AN INDIAN BURYING GROUND.

BY L. BELDING.

On the north bank of the Stockton Slough on land of Mr. Edward F. Jones is an extensive Indian burying ground where hundreds, if not thousands, of Indians have been buried, and where I have, during the last fourteen or fifteen years, found some very interesting relics, but none of them interested me as much as those which were made of the adobe soil of the neighborhood, and which appear to me to be unique. The burying ground is in an extensive stoneless tract and substitutes for stones were made from the convenient soil, apparently by wetting, shaping with the hand, marking, and then baking in fire. These artificial stones were usually nearly round and would weigh about a half-pound each, but there was a considerable variety in size, form and marking; the latter of which was probably indicative of family or individual ownership, and the stones were probably used for cooking food, but they may have had some connection with the burial customs of these Indians.

Among other things found here were two perforated discs which resemble a form described by Mr. Bowers and Paul Schumake, and which Mr. Henshaw refers to as weights to digging sticks.

These two were made of the same material and in the same manner as the artificial stones and were too frail to be used in the way Mr. Henshaw mentions in "Perforated Stones from California," Bureau of Ethnology, 1887.

A stone digging tool was found which was chisel-shaped at one end, was about sixteen inches long and about two inches in diameter. It must have been very useful in digging the Tule potato *(Sagittaria)* which is now sometimes called "China potato," which grew and still grows in abundance along the sloughs and in the extensive tule marshes of the vicinity.

The obsidian spear and arrow-heads found here were fine examples of aboriginal skill. Two obsidian crescent-shaped knives or implements, which had probably been used in dressing fish, had their convex edges squarely notched or blocked. They are or were on exhibition in the Smithsonian building in 1882, and differ from anything I have seen elsewhere.

The burial ground appears to have once been the site of an Indian village, as bones of elk, deer, fish, ducks, geese, and other birds are plentiful. A circular, saucer-shaped excavation for a fandango or sweathouse, is additional evidence that a village once occupied the spot. Many of the skeletons which appear to have been buried last, and about the same time, were probably victims of small-pox or some other epidemic.

Waves from passing steamboats have washed away a considerable part of the ground, and a large levee has recently been built on and of the mound.

RECENT ADDITIONS TO THE NORTH AMERICAN LAND MAMMAL FAUNA.

BY WALTER E. BRYANT.

For several years I have been keeping a list of the new species of North American mammals as the descriptions appeared, with notes on the changes of nomenclature, for convenience of reference. Since 1884, when Mr. True published "A Provisional List of the Mammals of North and Central America, and the West Indian Islands" (Proc. U. S. Nat. Mus. 1884, Appendix), I believe nothing has appeared in that line. Certainly the nomenclature of the class is in need of revision, and I am informed that an authority has in preparation some work of the kind.

Nothing is attempted in the present article but to give the names, authority, citation of publication and habitat as far as known, except in a few instances when changes have been made in order to bring the names more into conformity to the latest authorities. The species here enumerated are mainly or entirely additions to Mr. True's list, the general order of which has been followed. Considerable shuffling of names has been done in the literature upon the subject during the past few years, necessitated by the acquired knowledge concerning the earlier writers and the species treated of by them and not resulting from the whims of authors or the disregard to generally accepted principles of nomenclature. A few of these changes are noticed here when they concern a given species.

The writings of Allen, Merriam and Mearns have supplied the greater portion of the present compilation, which it is hoped will be useful to workers in mammalogy, especially to those whose growing interest in this class of animals may result in the future in the organization of a union such as has done so much for the ornithology of North America.

The majority of the additions here given as will be seen were described in—

North	American	Fauna,	No. 1,	issued	October	25, 1889.
"	"	"	" 2,	"	October	30, 1889.
"	"	"	" 3,	"	September	11, 1890.
"	"	"	" 4,	"	October	8, 1890.
"	"	"	" 5,	"	July	30, 1891.

Bulletin of the American Museum of Natural History, vol. ii, 1887–90; vol. iii, 1890–91; vol. iv, in press.

Under North America I have included the species described from the country recognized by the American Ornithologists' Union.

To Mr. T. S. Palmer, First Assistant of the Division of Ornithology and Mammalogy of the U. S. Department of Agriculture, I am greatly indebted for substantial aid in the preparation of this paper. He has kindly read the proof sheets and supplied most of the added generic names with data and about fifteen of the added species and noted several important eliminations in the list.

Mr. Palmer has also made some changes in the spelling of geographical names, in which he has followed the rulings of the U. S. Board on Geographic Names. When a single definite locality is

given it is the type locality and not necessarily the entire habitat of the species.

While the appended list of eliminated species is by no means complete, it is given for whatever assistance it may be to students.

GENERIC AND SUBGENERIC ADDITIONS AND CHANGES.

1. APLODONTIA Richardson. [Andetates *Haplodon*] Richardson.

(Cf. Merriam, Science, vii, March 5, 1886, p. 219; Ann. N. Y. Acad. Sci. iii, May, 1886, p. 312.)

2. PHENACOMYS Merriam.

Merriam, N. Am. Fauna, No. 2, Oct. 30, 1889, p. 28.

Type, *Phenacomys intermedius* Merriam, from Kamloops, British Columbia.

3. SITOMYS Fitzinger. [*Hesperomys* Waterhouse, antedates *Vesperimus* Coues.]

Fitzinger, Sitzungsber, math. nat. classe, K, Acad. Wiss. Wien, lvi, 1867, p. 97.

Type *Cricetus myoides* Gapper, from Lake Simcoe, Ontario, Canada.

(Cf. Merriam, Proc. Biol. Soc. Wash. vii, April 13, 1892, p. 27, foot-note.)

4. ONYCHOMYS Baird. [Subgenus.]

Baird, Mamm. N. Am. 1857, p. 458. Raised to generic rank by Merriam N. Am. Fauna, No. 2, p. 3.

Type, *Hypudæus leucogaster* Max Wied from old Fort Clark, North Dakota.

5. REITHRODONTOMYS Giglioli. [Antedates *Ochetodon* Coues, 1874.].

Giglioli, Richerche intorno alla Distribuzione Geografica Generale, Roma, 1873, p. 160, foot-note.

(Cf. Merriam, Proc. Biol. Soc. Wash, vii, Apr. 13, 1892, p. 26, foot-note.)

6. CHÆTODIPUS Merriam. [Subgenus of *Perognathus.*]

Merriam, N. Am. Fauna, No. 1, p. 5.

Type, *Chætodipus spinatus* Merriam, from lower Colorado River, California.

7. PERODIPUS Fitzinger. [Antedates *Dipodops* Merriam, 1890.]

Fitzinger, Sitzungsber. math. nat. Classe, K. Akad. Wiss. Wien, lvi, 1867, p. 126.

Type, *Dipodomys agilis* Gambel, from Los Angeles, California. (Cf. Merriam, Proc. Biol. Soc. Wash. vii, April 13, 1892, p. 26, foot-note).

8. MICRODIPODOPS Merriam.

Merriam, N. Am. Fauna, No. 5, July 30, 1891, p. 115.

Type, *Microdipodops megacephalus* Merriam, from Halleck, Nevada.

9. EUDERMA H. Allen.

Allen. Proc. Acad. Nat. Sci. Phila. Jan. 1892, p. 467.

Type, *Histiotus maculatus* J. A. Allen, from Los Angeles County, California.

10. OTOPTERUS Lydekker.

Flower & Lydekker, Mammals Living and Extinct, London, 1891, p. 673, foot-note.

Replaces *Macrotus* Gray which is preoccupied.

11. NOTIOSOREX Baird MS.

Coues, Bull. U. S. Geol. Surv. Terr. iii, May 15, 1877, p. 646. (Subgenus.)

Type, *Sorex (Notiosorex) crawfordi*, from Fort Bliss, Doña Ana County, New Mexico.

(Cf. Flower & Lydekker, Mam. Living and Extinct, 1891, p. 624, raised to generic rank.)

12. BASSARISCUS Coues.

Science ix, May 27, 1887, 516.

Replaces *Bassaris* Wagler which is preoccupied.

13. LATAX Gloger.

Nova Acta Acad. Cæs. Leop. Car. xiii, pt. ii, 1827, p. 511.

Revived by Stejneger to replace *Enhydra* Fleming which is preoccupied. (Cf. Stejneger, Naturen, 1885, p. 172.)

14. SPILOGALE Gray.

Proc. Zool. Soc. London, 1865, p. 150.

Revived by Merriam, N. Am. Fauna No. 4, p. 1.

Type, *Mephitis interrupta* Rafinesque.

15. LUTREOLA Wagner. [Subgenus.]

Suppl. Schreb, Saügth. ii, 1841, 241.

Used as genus by Merriam, Ann. Rep. Dept. Agriculture, 1887, (1888), p. 433.

In a paper entitled "The Geographic Distribution of Life in North America with special reference to the Mammalia," by C. Hart Merriam, M. D. (Proc. Biol. Soc. Wash. vii, April 13, 1892, pp. 1-64), the following subgenera are revived or used for the first time:

Teonoma Gray (bushy tailed wood-rats).

Neosorex Baird (genus of shrews reduced to subgenus).

Atophyrax Merriam (genus of shrews reduced to subgenus).

Tamiasciurus Trouessart (containing the chickarees).

Neosciurus Trouessart (subgenus of *Sciurus*).

Parasciurus Trouessart (subgenus of *Sciurus*.)

Xerospermophilus (type, *Spermophilus mohavensis*).

Ammospermophilus (type, *Spermophilus leucurus*).

Neofiber True (reduced to subgenus of *Arvicola*).

SPECIFIC AND SUBSPECIFIC ADDITIONS AND CHANGES.

1. DIDELPHIS VIRGINIANA CALIFORNICA (Bennett) Allen. Texas Opossum.

Didelphys californica Bennett, Pr. Zool. Soc. i, 1833, 40.

Texas to City of Mexico.

2. CARIACUS MACROTIS CALIFORNICUS (Caton). Southern Mule Deer.

Cervus macrotis var. *californicus* Caton., Am. Nat. x, Aug. 1876, p. 464.

Southern California.

3. ARCTOMYS DACOTA Merr. Black Hills Marmot.

Merriam, N. Am. Fauna, No. 2, p. 8.

Black Hills, Dakota.

4. CYNOMYS ARIZONENSIS Mearns.

Mearns, Bull. Am. Mus. Nat. Hist. ii, 4, p. 305.

Southern Arizona.

5. CYNOMYS GUNNISONI Baird. Short-tailed Prairie Dog.

Revived by Merriam, N. Am. Fauna, No. 3, p. 58.

Arizona; Colorado.

6. CYNOMYS LEUCURUS Merr.

Merriam, *ibid*, No. 4, p. 33.

Fort Bridger, Wyoming.

7. TAMIAS STRIATUS LYSTERI Rich.

Cf. Merriam, Am. Nat. xx, 1886, p. 242.

Mountains of Pennsylvania; Adirondack region of New York; northern New England; eastern Canada north to the Gulf of St. Lawrence, and in the interior north to James's Bay, Hudson's Bay.

8. TAMIAS STRIATUS GRISEUS Mearns.
Mearns, Bull. Am. Mus. Nat. Hist. iii, 2, p. 231.
Upper Mississippi Valley west of the Great Lakes.

9. TAMIAS CASTANURUS Merr.
Merriam, N. Am. Fauna, No. 4, p. 19.
Wahsatch Mountains, Utah.

10. TAMIAS CHRYSODEIRUS Merr.
Merriam, *ibid*, p. 19.
Fort Klamath, Oregon, and southward in the Sierra Nevada.

11. TAMIAS CINERASCENS Merr. Gray Ground Squirrel.
Merriam, *ibid*, p. 20.
Helena, Montana; Idaho.

12. TAMIAS MACROHABDOTES Merr. Long-eared Chipmunk.
Merriam, Proc. Biol. Soc. Wash. iii, Jan. 27, 1886, 25.
Sierra Nevada Mountains, Placer County, California.

13. TAMIAS OBSCURUS Townsend, MS. Lower California Chipmunk.
Allen, Bull. Am. Mus. Nat. Hist. iii, 1, June, 1890, 70.
San Pedro Martir Mountain, Lower California.

14. TAMIAS TOWNSENDII HINDSII (Gray). Redwood Chipmunk.
Revived by Allen in Bull. Am. Mus. Nat. Hist. iii, 1, 75.
Coast region of California, from San Francisco northward. Restricted to the narrow coast belt west of the Coast Range.

15. TAMIAS QUADRIMACULATUS Gray. Sacramento Chipmunk.
Gray, Ann. & Mag. Nat. Hist. 3d ser. xx, 1867, p. 435.
Revived by Allen, *ibid*, p. 80.
Valley of the Sacramento River, California, north to Shasta County, California, and Fort Klamath, Oregon.

16. TAMIAS SENEX Allen.
Allen, *ibid*, p. 83.
Sierra Nevada Mountains, Placer County, California, north to Fort Klamath, Oregon.

17. TAMIAS MERRIAMI Allen.
Allen, *ibid*, p. 84.

Mountains of Southern California, from San Diego County north to Tulare and Monterey counties.

18. TAMIAS SPECIOSUS Merriam, MS. San Bernardino Chipmunk.

Allen, *ibid*, p. 86.

San Bernardino Mountains, California.

19. TAMIAS FRATER Allen. Sierra Nevada Chipmunk.

Allen, *ibid*, p. 88.

Sierra Nevada Mountains, Placer County, California.

20. TAMIAS AMŒNUS Allen. Klamath Chipmunk.

Allen, *ibid*, p. 90.

Fort Klamath, Oregon, and southward to Placer County, California, Idaho.

21. TAMIAS CINEREICOLLIS Allen. Arizona Chipmunk.

Allen, *ibid*, p. 94.

San Francisco Mountain and neighboring mountains of Central Arizona.

22. TAMIAS UMBRINUS Allen. Uinta Chipmunk.

Allen; *ibid*, p. 96.

Mountains of Northern and Central Utah (Wahsatch and Uinta Ranges.)

23. TAMIAS QUADRIVITTATUS GRACILIS Allen. San Pedro Chipmunk.

Allen, *ibid*, p. 99.

Socorro County, New Mexico, and Apache County, Arizona.

24. TAMIAS QUADRIVITTATUS LUTEIVENTRIS Allen. Buff-bellied Chipmunk.

Allen, *ibid*, p. 101.

Main chain of the Rocky Mountains in Montana, from Helena northward, probably into British America.

25. TAMIAS QUADRIVITTATUS AFFINIS Allen. Columbian Chipmunk.

Allen, *ibid*, p. 103.

Interior of British Columbia, east of the Cascade Mountains.

26. TAMIAS QUADRIVITTATUS NEGLECTUS Allen. Lake Superior Chipmunk.

Allen, *ibid*, p. 106.

Northeastern Minnesota, Northern Wisconsin, northern peninsula of Michigan, and northern shore of Lake Superior.

27. TAMIAS MINIMUS Bach. Pale Chipmunk.

Revived by Allen, *ibid*, p. 110.

"Bad lands" and plains of Dakota, Montana, and Wyoming.

28. TAMIAS MINIMUS CONSOBRINUS Allen. Wahsatch Chipmunk.

Allen, *ibid*, p. 112.

Eastern border of the Great Basin (Eastern Utah, Western and Southern Colorado, and Northwestern New Mexico).

29. TAMIAS MINIMUS PICTUS Allen. Desert Chipmunk.

Allen, *ibid*, p. 115.

The Great Basin, from western border of Great Salt Lake westward, and from Southern Utah and Southern Nevada to the Snake Plains of Eastern Washington.

30. SPERMOPHILUS LEUCURUS Merr. Antelope Squirrel.

Tamias leucurus Merriam, N. Am. Fauna, No. 2, p. 20.

Southern Utah, northern Arizona, southern Nevada, southern California, and the peninsula of Lower California.

31. SPERMOPHILUS LEUCURUS CINNAMOMEUS Merr. White-tailed Chipmunk.

Tamias leucurus cinnamomeus Merriam, *ibid*, No. 3, p. 51.

Grand Cañon of the Colorado and Painted Desert, Arizona.

32. SPERMOPHILUS INTERPRES Merr.

Tamias interpres Merriam, *ibid*, No. 4, p. 21.

El Paso, Texas.

33. SPERMOPHILUS GRAMMURUS ATRICAPILLUS Bryant. Black-capped Ground Squirrel.

Bryant, Proc. Cal. Acad. Sci. 2d ser. ii, p. 26.

Peninsula of Lower California, from latitude 25° northward in mountainous region.

34. SPERMOPHILUS BELDINGI Merr. Sierra Nevada Spermophile.

Merriam, Ann. N. Y. Acad. Sci., iv, Dec. 28, 1888, p. 317.

Sierra Nevada Mountains, California.

35. SPERMOPHILUS ARMATUS Kennicott. Mountain Spermophile.

Revived by Merriam, N. Am. Fauna, No. 5, p. 38.

Uinta Mountains, Utah, to Blackfoot Mountains, Idaho.

36. SPERMOPHILUS ELEGANS Kennicott. Kennicott's Spermophile.

Revived by Merriam, *ibid*, p. 39.

Fort Bridger, Wyoming and northwestward to Lemhi Valley, Idaho.

37. SPERMOPHILUS COLUMBIANUS (Ord). Burrowing Squirrel.

Arctomys columbianus Ord, "Guthrie's Geog. 2d Am. Ed., ii, 1815, 292–303."

Revived by Merriam, *ibid*, p. 39.

Idaho.

38. SPERMOPHILUS MOHAVENSIS Merr. Mohave Desert Spermophile.

Merriam, *ibid*, No. 2, p. 15.

Mohave Desert, California.

39. SPERMOPHILUS NEGLECTUS Merr.

Merriam, *ibid*, p. 17.

Dolan Spring, Arizona.

40. SPERMOPHILUS SPILOSOMA PRATENSIS Merr.

Merriam, *ibid*, No. 3, p. 55.

San Francisco Mountain, Arizona.

41. SPERMOPHILUS SPILOSOMA OBSIDIANUS Merr. Dusky Spotted Spermophile.

Merriam, *ibid*, p. 56.

San Francisco Mountain, Arizona.

42. SPERMOPHILUS CRYPTOSPILOTUS Merr. Desert Spermophile.

Merriam, *ibid*, p. 57.

Painted Desert, Arizona.

43. SPERMOPHILUS CANESCENS Merr.

Merriam, *ibid.*, No. 4, p. 38.

Cochise County, Arizona.

44. SPERMOPHILUS SPILOSOMA MACROSPILOTUS Merr.

Merriam, *ibid*, p. 38.

Pinal County, Arizona.

45. SPERMOPHILUS SPILOSOMA MAJOR Merr.

Merriam, *ibid*, p. 39.

Albuquerque, New Mexico.

46. Sciurus fremonti mogollonensis Mearns. Mogollon Chickaree.

Sciurus hudsonius mogollonensis Mearns, Bull. Am. Mus. Nat. Hist. ii, 4, p. 277.

47. Sciurus hudsonius vancouverensis Allen. Vancouver Chickaree.

Allen, *ibid*, iii, 1, Nov. 14, 1890, p. 165.

Vancouver Island.

48. Sciurus hudsonius californicus Allen. California Chickaree.

Allen, *ibid*, p. 165.

Sierra Nevada Mountains, Placer County, California.

49. Sciurus carolinensis hypophæus Merr.

Merriam, Science, vii, No. 167, April 16, 1886, p. 351.

Minnesota.

50. Sciurus fossor nigripes Bryant. Black-footed Gray Squirrel.

Bryant, Proc. Cal. Acad. Sci. 2d ser. ii, p. 25.

Coast region of California, southward from San Francisco.

51. Sciuropterus volans sabrinus (Shaw). Hudsonian Flying Squirrel.

Sciurus sabrinus Shaw, Gen. Zoology, Mammalia, ii, pt. 1, 1801, 157.

Revived by Merriam in N. Am. Fauna, No. 5, p. 51.

Idaho.

52. Aplodontia major Merr.

Merriam, Science, vii, Mar. 5, 1886, p. 219; Ann. N. Y. Acad. Sci. iii, 10, May, 1886, p. 312.

California.

53. Fiber zibethicus pallidus Mearns. Pale Muskrat.

Mearns, Bull. Am. Mus. Nat. Hist. ii, 4, p. 280.

Arizona.

54. Evotomys carolinensis Merr.

Merriam, Am. Journ. Sci. xxxvi, Dec. 1888, p. 460.

Mountains of North Carolina.

55. Evotomys galei Merr. Gale's Red-backed Mouse.

Merriam, N. Am. Fauna, No. 4, p. 23.

Boulder County, Colorado.

56. EVOTOMYS OCCIDENTALIS Merr. Western Red-backed Mouse.

Merriam, *ibid*, p. 25.

Chehalis County, Washington.

57. EVOTOMYS CALIFORNICUS Merr. California Red-backed Mouse.

Merriam, *ibid*, p. 26.

Humboldt County, California.

58. EVOTOMYS IDAHOENSIS Merr. Idaho Red-backed Mouse.

Merriam, *ibid*, No. 5, p. 66.

Idaho.

59. EVOTOMYS GAPPERI BREVICAUDUS Merr.

Merriam, *ibid*, p. 119.

Black Hills, South Dakota.

60. EVOTOMYS DAWSONI Merr. Dawson's Red-backed Mouse.

Merriam, Am. Nat. xxii, July, 1888, 649.

Finlayson River, Northwest Territory.

61. PHENACOMYS INTERMEDIUS Merr.

Merriam, N. Am. Fauna, No. 2, p. 32.

Kamloops, British Columbia.

62. PHENACOMYS CELATUS Merr.

Merriam, *ibid*, p. 33.

Godbout, P. Q., Canada.

63. PHENACOMYS LATIMANUS Merr.

Merriam, *ibid*, p. 34.

Fort Chimo, Ungava, Hudson Bay Territory.

64. PHENACOMYS UNGAVA Merr.

Merriam, *ibid*, p. 35.

Fort Chimo, Ungava, Hudson Bay Territory.

65. PHENACOMYS LONGICAUDUS True.

True, Proc. U. S. Nat. Mus. xiii, 826, Nov. 15, 1890, p. 303.

Marshfield, Coos County, Oregon

66. PHENACOMYS OROPHILUS Merr. Mountain Lemming Mouse.

Merriam, N. Am. Fauna, No. 5, p. 65.

Idaho.

67. ARVICOLA DRUMMONDII Aud. & Bach.

Audubon & Bachman, N. Am. Quad. iii, 1854, 166.

Revived by Merriam, Proc. Biol. Soc. Wash. vii, Apr. 13, 1892, p, 25.

Rocky Mountains, Western Alberta.

68. ARVICOLA MOGOLLONENSIS Mearns. Mogollon Mountain Vole.

Mearns, Bull. Am. Mus. Nat. Hist. ii, 4, p. 283.

Mogollon Mountains, Central Arizona.

69. ARVICOLA (MYNOMES) ALTICOLUS Merr. Mountain Vole.

Merriam, N. Am. Fauna, No. 3, p. 67.

San Francisco Mountain, Arizona.

70. ARVICOLA (MYNOMES) MACROPUS Merr. Big-footed Arvicola.

Merriam, *ibid*, No. 5, p. 59.

Salmon River, Saw Tooth and Pahsimeroi Mountains, Idaho.

71. ARVICOLA (MYNOMES) MORDAX Merr. Cantankerous Arvicola.

Merriam, *ibid*, p. 61.

Idaho.

72. ARVICOLA (MYNOMES) NANUS Merr. Dwarf Arvicola.

Merriam, *ibid*, p. 62.

Idaho.

73. ARVICOLA (MYNOMES) LONGICAUDUS Merr. Long-tailed Arvicola.

Merriam, Am. Nat. xxii, Oct. 1888, 934.

Black Hills, South Dakota.

74. ARVICOLA AUSTERUS MINOR Merr. Northern Prairie Meadow Mouse.

Merriam, Am. Nat. xxii, July, 1888, 598.

Turtle Mountain, North Dakota.

75. ARVICOLA PALLIDUS Merr.

Merriam, Am. Nat. xxii, August, 1888, 702.

Fort Buford, North Dakota.

76. ARVICOLA PAUPERRIMUS Cooper. Pallid Lemming Mouse.

Revived by Merriam, *ibid*, p. 64.

Idaho, Washington, Nevada. (?)

77. SITOMYS TRUEI (Shufeldt).

Hesperomys truei Shufeldt, Proc. U. S. Nat. Museum, viii, Sept. 14, 1885, p. 403.

Fort Wingate, New Mexico.

78. SITOMYS ANTHONYI (Merr.)

Hesperomys (Vesperimus) anthonyi Merriam, Proc. Biol. Soc. Wash. iv, April 15, 1887, 5.

Grant County, New Mexico.

79. SITOMYS FLORIDANUS (Chapman).

Hesperomys floridanus Chapman, Bull. Am. Mus. Nat. Hist. ii, 3, 117.

Gainesville, Florida.

80. SITOMYS NIVEIVENTRIS (Chapman).

Hesperomys niveiventris Chapman, *ibid*, p. 117.

Florida.

81. SITOMYS AMERICANUS ARCTICUS Mearns. Arctic Deer Mouse.

Hesperomys leucopus arcticus Mearns, Bull. Am. Mus. Nat. Hist. ii, 4, p. 285.

Hudson Bay Territory.

82. SITOMYS AMERICANUS NEBRACENSIS (Baird). Black-eared Deer Mouse.

Hesperomys leucopus nebracensis (Baird) Mearns, *ibid*, p. 285.

Montana; northwestern part of Indian Territory.

83. SITOMYS AMERICANUS TEXANUS (Woodhouse). Texan Deer Mouse.

Hesperomys leucopus texanus (Woodhouse) Mearns, *ibid*, p. 285

Northwestern Texas; Indian Territory.

84. SITOMYS MEGALOTIS (Merr.) Leaf-eared Cliff Mouse.

Hesperomys megalotis Merriam, N. A. Fauna, No. 3, p. 63.

Grand Cañon of the Colorado and Desert of the Little Colorado, Arizona.

85. SITOMYS AMERICANUS RUFINUS (Merr.) White-footed Mouse.

Hesperomys leucopus rufinus Merriam, *ibid*, p. 65.

San Francisco Mountain, Arizona.

86. SITOMYS FRATERCULUS (Miller).

Vesperimus fraterculus Miller, Am. Nat. xxvi, March, 1892, 261.

Dulzura, San Diego County, California.

87. SITOMYS BOYLII (Baird.)

Hesperomys boylii Baird, Proc. Acad. Nat. Sci. Phila. 1855, 335.

Revived by Merriam, Proc. Biol. Soc. Wash. vii, April 13, 1892, p. 32.

Middle Fork of the American River, California.

88. SITOMYS MACROPUS Merr.

Merriam, Proc. Biol. Soc. Wash. vii, April 13, 1892, p. 34.

Hesperomys macropus Merriam, N. Am. Fauna, No. 4, p. 53.

Lake Worth, Florida.

89. SITOMYS NASUTUS (Allen).

Vesperimus nasutus Allen, Bull. Am. Mus. Nat. Hist. iii, 2, June 30, 1891, p. 299.

Larimer County, Colorado.

90. SITOMYS MEARNSII (Allen).

Vesperimus mearnsii Allen, *ibid*, p. 300.

Brownsville, Texas; Fort Verde, Arizona.

91. SITOMYS CRINITUS (Merr.) Cañon Mouse.

Hesperomys crinitus Merriam, N. Am. Fauna, No. 5, p. 53.

Snake River, Idaho.

92. SITOMYS TAYLORI (Thomas).

Hesperomys (Vesperimus) taylori Thomas, Ann. & Mag. Nat. Hist. 5th ser. xix, 1887, p. 66.

San Diego, Duval County, Texas.

93. ORYZOMYS AQUATICUS Allen.

Allen, Bull. Am. Mus. Nat. Hist. iii, 2, June 30, 1891, p. 289.

Brownsville, Texas.

94. ONYCHOMYS LONGIPES Merr. Texas Grasshopper Mouse.

Merriam, N. Am. Fauna, No. 2, p. 1.

Concho County, Texas.

95. ONYCHOMYS LONGICAUDUS Merr. Long-tailed Grasshopper Mouse.

Merriam, *ibid*, p. 2.

St. George, Utah.

96. ONYCHOMYS MELANOPHRYS Merr. Black-eyed Grasshopper Mouse.

Merriam, *ibid*, p. 2.

Kanab, Utah.

97. ONYCHOMYS MELANOPHRYS PALLESCENS Merr. Desert Scorpion Mouse.

Merriam, *ibid*, No. 3, p. 61.

Apache County, Arizona.

98. ONYCHOMYS LEUCOGASTER BREVICAUDUS Merr. Idaho Grasshopper Mouse.

Merriam, *ibid*, No. 5, p. 52.

Idaho.

99. ONYCHOMYS FULIGINOSUS Merr. Dusky Scorpion Mouse.

Merriam, *ibid*, No. 3, p. 59.

Between San Francisco Mountain and Desert of the Little Colorado, Arizona.

100. SIGMODON HISPIDUS LITTORALIS Chapman.

Chapman, Bull. Am. Mus. Nat. Hist. ii, 3, p. 118.

"Probably confined to the coasts of Southern Florida."

101. SIGMODON HISPIDUS ARIZONÆ Mearns. Arizona Cotton Rat.

Mearns, *ibid*, ii, 4, p. 287.

Fort Verde, Arizona.

102. SIGMODON HISPIDUS TEXIANUS (Aud. & Bach.)

Arvicola texiana Aud. & Bach. Quad. N. Am. iii, 1853, p. 229.

Revived by Allen, *ibid*, iii, 2, June 30, 1891, p. 287.

Texas.

103. NEOTOMA CINEREA OCCIDENTALIS (Baird). Dusky Wood Rat.

Revived by Allen, *ibid*, p. 287.

Idaho; Shoalwater Bay, Washington.

104. NEOTOMA CINEREA DRUMMONDII (Richardson).

Myoxus drummondii Richardson, Zool. Journ. iii, 1828, 517.

Revived by Merriam, Proc. Biol. Soc. Wash. 7, April 13, 1892, p. 25.

Rocky Mountains, British Columbia.

105. NEOTOMA BRYANTI Merr. Bryant's Wood Rat.

Merriam, Am. Nat. xxi, Feb. 1887, p. 191.

Cerros Island, Lower California.

106. NEOTOMA MICROPUS Baird. Texan Wood Rat.

Revived by Allen, Bull. Am. Mus. Nat. Hist. iii, 2, June 30, 1891, p. 282.

San Fernando River, Tamaulipas, Mexico, northward to Brownsville, Texas.

107. NEOTOMA MICROPUS CANESCENS Allen. Pallid Wood Rat.

Allen, *ibid*, p. 285.

Oklahoma Territory.

108. THOMOMYS PERPALLIDUS Merr. Desert Pocket Gopher.

Thomomys talpoides perpallidus Merriam, Science viii, 203, Dec. 24, 1886, p. 588.

Colorado Desert, California; Painted Desert, Arizona.

109. THOMOMYS CLUSIUS FUSCUS Merr. Mountain Pocket Gopher.

Merriam, N. Am. Fauna, No. 5, p. 69.

Idaho, in mountains.

110. THOMOMYS FULVUS (Woodhouse).

Geomys fulvus Woodhouse, Proc. Acad. Nat. Sci. Phila. vi, 1852, 201.

Revived by Merriam, N. Am. Fauna, No. 3, p. 71.

San Francisco Mountain, Arizona.

111. GEOMYS PERSONATUS True.

True, Proc. U. S. Nat. Mus. xi, Jan. 5, 1889, p. 159.

Padre Island, Texas.

112. GEOMYS BURSARIUS LUTESCENS Merr.

Merriam, N. Am. Fauna, No. 4, p. 51.

Lincoln County, Nebraska.

113. PEROGNATHUS FASCIATUS FLAVESCENS Merr.

Merriam, N. Am. Fauna, No. 1, p. 11.

Kennedy, Nebraska.

114. PEROGNATHUS BIMACULATUS Merr.

Merriam, *ibid*, p. 12.

Fort Whipple, Arizona.

115. PEROGNATHUS LONGIMEMBRIS (Coues).

Merriam, *ibid*, p. 13.

Fort Tejon; San Bernardino, California.

116. PEROGNATHUS APACHE Merr.

Merriam, *ibid*, p. 14.

Apache County, Arizona.

117. PEROGNATHUS INORNATUS Merr.

Merriam, *ibid*, p. 15.

Fresno County, California.

118. PEROGNATHUS OLIVACEUS Merr.

Merriam, *ibid*, p. 15.

Kelton, Utah.

119. PEROGNATHUS OLIVACEUS AMŒNUS Merr.
Merriam, *ibid*, p. 16.
Nephi, Utah.

120. PEROGNATHUS FORMOSUS Merr.
Merriam, *ibid*, p. 17.
St. George, Utah.

121. PEROGNATHUS INTERMEDIUS Merr.
Merriam, *ibid*, p. 18.
Mud Spring, Arizona.

122. PEROGNATHUS FALLAX Merr.
Merriam, *ibid*, p. 19.
San Bernardino, California.

123. PEROGNATHUS OBSCURUS.
Merriam, *ibid*, p. 20.
Camp Apache, Grant County, New Mexico.

124. PEROGNATHUS SPINATUS Merr.
Merriam, *ibid*, p. 21.
Lower Colorado River, California.

125. PEROGNATHUS PARADOXUS Merr.
Merriam, *ibid*, p. 24.
Trego County, Kansas.

126. PEROGNATHUS PARADOXUS SPILOTUS Merr.
Merriam, *ibid*, p. 25.
Gainesville, Cook County, Texas.

127. PEROGNATHUS CALIFORNICUS Merr.
Merriam, *ibid*, p. 26.
Berkeley, California.

128. PEROGNATHUS ARMATUS Merr.
Merriam, *ibid*, p. 27.
Mount Diablo, California.

129. PEROGNATHUS LORDI (Gray).
Merriam, *ibid*, p. 28.
British Columbia.

130. PEROGNATHUS MOLLIPILOSUS Coues.
Merriam, *ibid*, p. 29.
Fort Crook, California.

131. PEROGNATHUS FULIGINOSUS Merr. Dusky Pocket Mouse.

Merriam, *ibid*, No. 3, p. 74.
San Francisco Mountain, Arizona.

132. PEROGNATHUS FEMORALIS Allen.
Allen, Bull. Am. Mus. Nat. Hist. iii, 2, June 30, 1891, p. 281.
Dulzura, San Diego County, California.

133. PEROGNATHUS MERRIAMI Allen.
Allen, *ibid*, iv, 1, March 25, 1892, p. 45.
Southeastern Texas.

134. DIPODOMYS DESERTI Stephens.
Stephens, Am. Nat. xxi, Jan. 1887, p. 42, pl. v.
Mohave and Colorado Desert regions of southeastern California.

135. DIPODOMYS MERRIAMI Mearns.
Mearns, Bull. Am. Mus. Nat. Hist. ii, 4, p. 290.
New River, Arizona.

136. DIPODOMYS AMBIGUUS Merr.
Merriam, N. Am. Fauna, No. 4, p. 42.
El Paso, Texas.

137. DIPODOMYS SPECTABILIS Merr.
Merriam, *ibid*, p. 46.
Dos Cabezos, Cochise County, Arizona.

138. DIPODOMYS CALIFORNICUS Merr.
Merriam, *ibid*, p. 49.
Mendocino County, California.

139. PERODIPUS COMPACTUS (True).
Dipodomys compactus True, Proc. U. S. Nat. Mus. xi, Jan. 5, 1889, p. 160.
Padre Island, Texas.

140. PERODIPUS CHAPMANI (Mearns).
Dipodomys chapmani Mearns, *ibid*, p. 291.
Fort Verde, Arizona.

141. PERODIPUS LONGIPES Merr.
Dipodops longipes Merriam, N. Am. Fauna, No. 3, p. 71.
Painted Desert, Arizona.

142. PERODIPUS SENNETTI (Allen).
Dipodops sennetti Allen, Bull. Am. Mus. Nat. Hist. iii, 2, April 29, 1891, p. 226.
Near Brownsville, Cameron County, Texas.

143. PERODIPUS RICHARDSONI Allen.
Allen, Bull. Am. Mus. Nat. Hist. iii, 2. June 30, 1891, p. 277.
"Northern Texas to southern Wyoming and westward to the Rocky Mountains."

144. MICRODIPODOPS MEGACEPHALUS Merr.
Merriam, N. Am. Fauna, No. 5, p. 115.
Halleck, Nevada.

145. ZAPUS INSIGNIS Miller.
Miller, Am. Nat. xxv, Aug. 1891, p. 742.
Nova Scotia and New Brunswick.

146. LAGOMYS SCHISTICEPS Merr.
Merriam, N. Am. Fauna, No. 2, p. 11.
Sierra Nevada Mountains, California.

147. LEPUS CINERASCENS Allen.
Allen, Bull. Am. Mus. Nat. Hist. iii, 1, Oct. 1890, p. 159.
Los Angeles County, California.

148. LEPUS SYLVATICUS FLORIDANUS Allen.
Allen, *ibid*, p. 160.
Brevard County, Florida.

149. LEPUS IDAHOENSIS Merr. Idaho Pygmy Rabbit.
Merriam, N. Am. Fauna, No. 5, p. 75.
Idaho; northern Nevada; (Eastern Oregon and Washington?).

150. LEPUS INSULARIS Bryant.
Bryant, Proc. Cal. Acad. Sci. 2d, ser., iii, p. 92.
Espiritu Santo Island, Lower California.

151. LEPUS ALLENI Mearns. Allen's Hare,
Mearns, Bull. Am. Mus. Nat. Hist. ii, 4, p. 294.
Arizona.

152. LEPUS MELANOTIS Mearns. Eastern Jackass Hare.
Mearns, *ibid*, p. 297.
Kansas; Western Texas and Indian Territory.

153. ATALAPHA TELIOTIS H. Allen.
H. Allen, Proc. Am. Phil. Soc. xxix, Feb. 11, 1891, p. 5.
Southern California?

154. VESPERTILIO CILIOLABRUM Merr.
Merriam, Proc. Biol. Soc. Wash. iv, Dec. 17, 1886, p. 1–4.
Kansas and New Mexico.

155. VESPERTILIO LONGICRUS True.
True, Science, viii, Dec. 24, 1886, p. 528.
Puget Sound, Washington.

156. VESPERTILIO MELANORHINUS Merr. Black-nosed Bat.
Merriam, N. Am. Fauna, No. 3, p. 46.
San Francisco Mountain, Arizona.

157. MOLOSSUS CALIFORNICUS Merr.
Merriam, *ibid*, No. 4, p. 31.
Alhambra, Los Angeles County, California.

158. NYCTINOMUS FEMOROSACCUS Merr.
Merriam, *ibid*, No. 2, p. 23.
Colorado Desert, California.

159. NYCTINOMUS MOHAVENSIS Merr.
Merriam, *ibid*, p. 25.
Fort Mojave, Arizona.

160. EUDERMA MACULATUM (J. A. Allen).
Histiotus maculatus Allen, Bull. Am. Mus. Nat. Hist. iii, 2, Feb. 20, 1891, p. 195.
Los Angeles County, California.

161. SOREX PERSONATUS Geoffroy.
Geoffroy, Mém. du Muséum, xv, 1827, 122–125.
Labrador to Massachusetts, Ohio to Nebraska.

162. SOREX RICHARDSONII Bachman.
Bachman, Journ. Acad. Nat. Sci. Phila. vii, 1837, p. 383.
Revived by Merriam, Ann. Rept. Dept. Agr. 1887 (1888), p. 435.
Canada.

163. SOREX MONTICOLUS Merr. Mountain Shrew.
Merriam, N. Am. Fauna, No. 3, p. 43.
San Francisco Mountain, Arizona.

164. SOREX IDAHOENSIS Merr. Idaho Shrew.
Merriam, *ibid*, No. 5, p. 32.
Salmon River and Saw Tooth Mountains, Idaho.

165. SORREX MERRIAMI Dobson.
Dobson, Mon. Insectivora, part iii, fasc. 1, May, 1890, pl. xxiii.
Fort Custer, Montana.

166. SOREX DOBSONI Merr. Dobson's Shrew.
Merriam, *ibid*, p. 33.
Saw Tooth Mountains, Idaho.

167. SOREX VAGRANS SIMILIS Merr.
Merriam, *ibid*, p. 34.
Salmon River and Pahsimeroi Mountains, Idaho.

168. SOREX HYDRODROMUS Dobson.
Dobson, Ann. & Mag. Nat. Hist., 6th ser. iv, 1889, p. 372.
Unalaska Island, Aleutian Islands.

169. SOREX ALBIBARBIS (Cope).
Neosorex albibarbis Cope, Proc. Acad. Nat. Sci. Phila., 1862, p. 188.
Revived by Merriam, Proc. Biol. Soc. Wash. vii, Apr. 13, 1892, p. 25.
Franconia Mountains, New Hampshire.

170. BLARINA BREVICAUDA CAROLINENSIS (Bach.)
Sorex carolinensis Bachman, Journ. Acad. Nat. Sci. Phila. vii, pt. 2, 1837, p. 366.
Type from South Carolina.

171. SCALOPS ARGENTATUS TEXANUS Allen.
Allen, Bull. Am. Mus. Nat. Hist. iii, 2, April 29, 1891, p. 221.
Presidio County, Texas.

172. MEPHITIS ESTOR Merr.
Merriam, N. Am. Fauna, No. 3, p. 81.
San Francisco Mountain, Arizona.

173. SPILOGALE GRACILIS Merr.
Merriam, *ibid*, p. 83.
Grand Cañon of the Colorado, Arizona.

174. SPILOGALE INTERRUPTA (Raf.)
Revived by Merriam, *ibid*, No. 4, p. 8.
Kansas.

175. SPILOGALE RINGENS Merr.
Merriam, *ibid*, p. 9.
Hale County, Alabama.

176. SPILOGALE INDIANOLA Merr.
Merriam, *ibid*, p. 10.
Gulf Coast of Texas (?).

177. SPILOGALE LUCASANA Merr.
Merriam, *ibid*, p. 11.
Cape St. Lucas, Lower California.

178. SPILOGALE LEUCOPARIA Merr.
Merriam, *ibid*, p. 11.
Mason County, Texas.

179. SPILOGALE SAXATILIS Merr.
Merriam, *ibid*, p. 13.
Provo, Utah.

180. SPILOGALE PHENAX Merr.
Merriam, *ibid*, p. 13.
Marin County, California.

181. SPILOGALE PHENAX LATIFRONS Merr.
Merriam, *ibid*, p. 15.
Oregon and Washington, west of Cascade Mountains.

182. SPILOGALE PHENAX ARIZONÆ Mearns. Arizona Striped Skunk.
Mearns, Bull. Am. Mus. Nat. Hist. iii, 2, p. 231.
Fort Verde, Arizona,

183. TAXIDEA AMERICANA NEGLECTA Mearns.
Mearns, *ibid*, p. 250.
Northern California.

184. PUTORIUS CULBERTSONI Baird MS.
Coues, Fur-bearing Animals, 1877, p. 136.
Revived by Merriam, Proc. Biol. Soc. Wash. vii, April 13, 1892, p. 25.
Fort Laramie, Wyoming; Fort Union, Montana.

185. PUTORIUS ARIZONENSIS Mearns. Arizona Weazel.
Mearns, *ibid*, p. 234.
Mountains and high plateau region of Arizona, down to the lower limit of the forest zone of *Pinus ponderosa*.

186. MUSTELA CAURINA Merr.
Merriam, N. Am. Fauna, No. 4, p. 27.
Chehalis County, Washington.

187. CANIS NUBILUS Say. Timber Wolf.
Revived by Merriam, *ibid*, No. 5, p. 82.

188. UROCYON VIRGINIANUS SCOTTII Mearns. Scott's Fox.
Mearns, Bull. Am. Mus. Nat. Hist. iii, 2, p. 236.
Southern California; Arizona and western New Mexico.

189. VULPES MACROTIS Merr.
Merriam, Proc. Biol. Soc. Wash. iv, 1886-88, p. 135.
Southern California.

190. Lynx baileyi Merr.

Merriam, N. Am. Fauna, No. 3. p. 79.

Arizona.

ELIMINATED.

Tamias minimus melanurus Merr.

Merriam, N. Am. Fauna, No. 4, p. 22.

Proves to be a phase of the molt of *T. m. pictus.* (Cf. Merriam, N. Am. Fauna, No. 5. p. 46, foot-note.)

Tamias asiaticus pallidus Allen.

A synonym of *T. minimus* (Cf. Allen, Bull. Am. Mus. Nat. Hist. ii, 1 ,1890, p. 113).

Sitomys americanus deserticolus (Mearns). Desert Deer Mouse.

Hesperomys leucopus deserticolus Mearns, Bull. Am. Mus. Nat. Hist. ii, 4, p. 285.

Identical with *Sitomys a. sonoriensis.*

Vesperugo merriami Dobson.

Dobson, Mon. Insectivora, pt. iii, fasc. 1, May, 1890, pl. xxiii.

Identical with *Vesperugo. hesperus* (Cf. True, Proc. U. S. Nat. Mus. x, Aug. 6, 1888, p. 515).

Rangifer tarandus (Linn.)

THE DISTRIBUTION OF THE FLORA OF THE CAPE REGION OF BAJA CALIFORNIA.*

BY T. S. BRANDEGEE.

The Cape Region of Lower California is a mountainous extent of country, about 80 miles long and 30 wide, situated mostly between the twenty-third and twenty-fourth degrees of north latitude. At one time, it may have been an island, and have been separated from the northern portion of the peninsula by a wide sheet of water then connecting the Pacific Ocean with the Gulf of California, now a sandy plain and upland hardly rising more than one hundred and fifty feet above the level of the sea. The northern direction taken by the main mountain ranges of the region is followed by the islands Espiritu Santo, San José and Santa Catalina out into the Gulf of

* A list of plants of the Cape Region of Baja California is published in Proc. Cal. Acad. Ser. 2, vol. iii, 108, and a number of additions will soon appear in the publications of the same society.

California, and Ceralbo Island, east of La Paz, perhaps represents the continuation of the Coast Range in the same direction.

Lower California is a Mexican Territory; divided into two departments, and the Cape Region forms a portion of the Department of the South, which has for its capital La Paz.

This region, although small, on account of its position with respect to the peninsula and its distance from the main land of Mexico, possesses a flora in part endemic, in part common, to that of other countries, which by its distribution and peculiarities seems to be worthy of the publication of the following notes and table.

The mountains, according to the maps of the Coast Survey, reach nearly to a height of 6,000 feet above the level of the sea; their summits in winter are cool and pleasant, with occasional frosts at night and sometimes ice a quarter of an inch thick is formed on standing water. Clouds envelope the highest portion from June to September, and then thunder storms are frequent. In the lower altitudes, frosts are unknown and the heat is what would be expected in a region situated about the Tropic of Cancer and in the northern limit of growth of the cocoanut, the guava and the aguacate.* The winds from the ocean and gulf blowing over this narrow strip of land serve somewhat to reduce the heat of the sun's rays during the day and render the nights not unpleasant during the hottest time of the year.

The year is divided into the wet and dry seasons. The rains of the wet season are expected between June and September; they come mostly in the form of showers and seem to be unequally distributed over the region. During one of my visits, the vegetation about San José del Cabo was green and growing as the result of many showers, while about La Paz every plant was dry and withered. The lower elevations, excepting at the time of rains, are dry, and running water is rarely found except in the San José River, about Todos Santos, San Bartolomè and a few other places; but near the tops of the mountains, some small streams run throughout the year some distance downward, but are soon lost amongst the rocks and sand. Some years no rains fall except on the mountain tops,

*The fruit of this plant, which is too sparingly found in our markets, is commonly known as "alligator pear," a rather unlovely corruption of its Spanish name.

and one time of drought, when none fell upon the low lands during more than thirty months, made a lasting impression on the inhabitants.

During the dry season most of the vegetation is in a state of rest, many of the bushes or small trees are leafless, the annuals have disappeared and the dry stalks of herbaceous perennials mark the place from which a new growth will rapidly appear after the first summer rain. This region is usually spoken of by travelers who have sailed along its Pacific Coast and rounded the rocky promontory of Cabo San Lucas, as a forbidding and barren country, and so it is until the summer rains bring life to the vegetation. Residents of a temperate climate, where the change from winter to summer is gradual and the fullness of vegetable life is not reached until the first warmth of spring has become the heat of summer, cannot realize the sudden change that comes over a tropical region, when at the hottest time of the year heavy rains cause immediately every leaf to appear and every bud to grow.

The Cape Region is quite thickly covered with large bushes and small trees with an abundance of climbing and twining plants using them for supports. These altogether sometimes become so dense that it is impossible to ride or walk between them, and to go through them is usually not to be thought of on account of the spines and thorns.

The most conspicuous plants of the lower elevations on account of their abundance, their size and the showiness of their flowers are: *Fouquieria spinosa*, *Sida Xanti*, *Abutilon Xanti*, *Hibiscus ribifolius*, *Esenbeckia flava*, *Cardiospermum Halicacabum*, *Mimosa Xanti*, *Lysiloma candida*, *Calliandra Californica*, *Acacia filicina*, *Cereus Pringlei*, *pecten-aboriginum*, *gummosus & Thurberi*, *Dysodia speciosa*, *Viguiera deltoidea & tomentosa*, *Bebbia atriplicifolia*, *Plumiera acutifolia*, *Ipomœa aurea*, *Calophanes peninsularis*, *Beloperone Californica*, *Justicia Palmeri*, *Hyptis tephrodes & lanifolia*, *Antigonum leptopus*, *Yucca baccata*, and others that perhaps deserve mention. The Burseras are very abundant and well distributed throughout the region, but their flowers are insignificant although the fruit is somewhat conspicuous; and equally deserving of notice, for similar reasons are Karwinskia, Cyrtocarpa, *Pithecolobium flexicaule*, Albizzia, and *Ipomœa bracteata*. Other plants are extremely abundant in certain localities, and some are confined to small areas where they

form a large part of the vegetation. The sands of the sea shore from Todos Santos to San José abound in *Euphorbia leucophylla*, and *Ipomœa Pes-capræ;* Rhachidospermum and Martynia are usually in company with them; the fences and hedges about the fields and gardens are the home of the tall climbing Asclepiads; the lagoons near La Paz are filled with mangrove *(Rhizophora Mangle)*, and the saline flats of their vicinity produce most of the chenopods of the flora. The high mountain flora consists mostly of one species of pine *(Pinus cembroides)*, oaks, madroño and Nolina, with some cottonwoods and willows along the streams, and with smaller plants, such as Lopezia, Heterotoma, Lobelia, Dysodia, Eupatorium, Sphacele, Gilia, ferns, etc., growing amongst them.

Although most of the vegetation, especially that of the lower elevations, blooms during the rainy season, there are some notable exceptions. Some plants are in flower during the whole year, but produce a greater abundance either in spring or the "rainy season." The scarlet flowers of Justicia, Beloperone and Calliandra, can be found at any time, but are most common in March and April. Rubus, Heterotoma, Sphacele, of the high mountains, and Eucnide, most of the Daleas, Tephrosia, Fouquieria, Viguiera, *Perityle crassifolia* of the lower elevations, are examples of plants that are in flower the whole year, but their blossoms are most abundant during the rainy season.

The following plants belonging to the flora of the mountain tops blossom only during the first months of the year, in the "dry season:" Thalictrum, Ranunculus, Stellaria, Sagina, Hypericum, Nasturtium, Geranium, Trifolium, Hosackia, Prunus, Fragaria, Heteromeles, Ribes, Epilobium, Rumfordia, Perezia, Lobelia, Arbutus, Gilia, Erythræa, Mimulus, Sibthorpia, Brunella, Polygonum, Populus, Salix, Epipactis, Sisyrinchium, Juncus, Carex, Tripsacum, Festuca. All these genera, with two or three exceptions, belong to a temperate climate and are found within the tropics only on high mountains. The fact that they retain the habit of blooming in the spring contrary to that of the mass of vegetation of the region is a most interesting one. With the advent of the rains comes a great crowd of flowers such as Desmodiums, Œnothera, Lopezia, Cyclanthera, Begonia, Mitracarpus, Valeriana, Stevia, Viguiera, Carminatia, Baccharis, Verbesina, Heterospermum, Bidens, Dysodia, Tagetes; Buchnera, Clevelandia, Dicliptera, Mirabilis, and most of

the orchids and ferns, etc., belonging in general to a more southern flora than those of the spring.

Amongst the plants growing at lower elevation are the following that flower in the springtime: *Sisymbriun crenatum*, Atamisquea, *Abutilon Californicum*, Vitis, Sapindus, Lupinus, Erythrina, *Cæsalpinia placida*, Prosopis, *Acacia Farnesiana* and *Wrightii*, Lysiloma, *Pithecolobium Mexicanum*, Cotyledon, Lythrum, Mamillaria, *Cereus pecten-aboriginum*, *Pringlei*, *Schottii* and *Thurberi*, *Diodia crassifolia*, Eryngium, Hofmeisteria, *Pluchea odorata*, *Buddleia crotonoides*, *Samolus ebracteatus*, Phacelia, Nama, *Euphorbia Xanti* and two or three Agaves. This collection of names, unlike that of the mountain spring-blooming plants, does not remind one of a northern flora. It might be expected that Lupinus, Lythrum, Samolus, Phacelia, and Nama, would blossom in the spring, but that habit does not seem fit for such semi-tropical genera as Lysiloma, Erythrina, Albizzia, Pithecolobium, etc.

It is often impossible to decide with certainty whether a plant is native, or whether it should be considered an immigrant recently introduced by the agency of man. Conocarpus, for instance, is a rare bush of the southern shores and belongs to the maritime flora of tropical climates, a flora represented along the coast by several species of plants but, though probably derived from the south, does not belong to the class generally meant by "introduced plants."

The weeds of the fields and trails, certainly derived from other regions, are: *Malva borealis*, *Brassica nigra*, *Melilotus parviflora*, *Momordica charantia*, *Xanthium strumarium*, *Sonchus oleraceus*, *Polygonum acre*, *Desmodium scorpiurus*, and there are others more common; the universally distributed weeds of towns and cultivated grounds, that are not so evidently introduced, these are: *Portulaca oleracea*, *Sida rhombifolia*, *Cassia Absus & Tora*, *Mollugo verticillata & cerviana*, Richardia, Amarantus, and Euphorbia.

Only four of the genera of the Cape Region are supposed to be endemic, and three of them are certainly not very distinct from their nearest relatives. The most distinct, Coulterella, has been found only along the gulf shore, east from La Paz, but as it is strictly a maritime plant it is to be expected from neighboring coasts.

The annexed table, showing in a condensed form the geographical distribution of the flowering plants and ferns and

their relation to the floras of neighboring regions, especially the Mexican main land, is based upon 732 species. These are the result of collections made by Dr. Hinds of H.M.S. Sulphur in 1839, at Cabo San Lucas; by L. J. Xantus de Vesey in 1859-1860, about the same place; by Dr. Edward Palmer at La Paz in 1890, and by the writer at various localities during three trips in 1890 and 1892. Seventy-two species or nearly ten per cent. of the whole number seem to be endemic and future exploration together with the identification of unnamed specimens may increase this proportion, although a more complete knowledge of the botany of Sinaloa and Sonora will probably show that some plants now considered peculiar to the Cape Region only appear so on account of our ignorance concerning their distribution. Three hundred and sixty-two of the Cape Region species are found growing on the peninsula from Magdalena Bay and Comondu northward, and nearly one-half of this number extend into Alta California; sixty-four of them are peculiar to the peninsula.

Mr. Hemsley in Biologia Centrali-Americana, iv, 139, considers Mazatlan the southern limit of the North Mexican flora upon the west coast; assuming this to be correct, nearly five hundred of the species belong to that flora, and with few exceptions they all belong to the flora of Sonora.

The adjacent mainland, Sinaloa, has not been as well explored botanically as Sonora, but judging from our scanty data the Mexican part of the Cape Region flora bears much less resemblance to it than to the more northern Sonora, and the flora as a whole is decidedly that of Sonora and not an extension of that of Alta California southward as has usually been supposed. The few plants that probably belong to a more southern flora are found along the shore or in the southeast about San José and Miraflores.

Some of these semi-tropical maritime and brackish-water plants are found also on the southern end of the Peninsula of Florida. Rhizophora, Conocarpus, Avicennia, Laguncularia, *Ipomœa Pes-capræ* and *acetosæfolia* and *Scævola Plumieri* are common to American tropical shores, and reach their northern limit at about the same latitude on the Peninsula of Baja California as on that of Florida. The number common to this region and Florida, however, is not large, and of about twenty-five having such wide spread distribution, some like *Samolus ebracteatus* and *Centunculus mini-*

mus are found across the continent, while others may by future exploration have their now apparently widely separated habitats connected along a more southern route.

The number of genera in the ninety-nine orders found in the region is three hundred and ninety, and two hundred and thirty of them are represented by a single species, the flora being essentially insular the proportion of genera to species is large as in island floras. The largest genera are: Euphorbia with about twenty species, Cereus with nine, Acacia nine, Desmodium eleven, Cassia seven, Dalea seven, Ipomæa fourteen, etc. Leguminosæ, the largest order, has ninety-five species that are in most cases widely distributed throughout the region and abundant, so that this class of plants is the predominating one of the region. The second largest is Compositæ of eighty species; some of them are very common and some such as Franseria, Eupatorium, Brickellia, become almost arborescent. Euphorbiaceæ has forty-eight, many of them small prostrate species of the genus Euphorbia, but one species of Phyllanthus is a small tree. Malvaceæ has twenty-two, Graminæ fifty-two, Filices twenty-two, Convolvulaceæ twenty-five, Acanthaceæ seventeen. The relative positions of Leguminosæ and Compositæ in the flora of the world and that of Mexico are reversed and other large orders occupy different positions in the scale, but the region considered is so small that such comparisons have little value.

By the term "Mountain Flora" is meant those plants growing only upon or very near to the top of the highest ridges and summits of the mountains. Some plants of the lower elevations, such as Heterospermum, Behria, Centunculus, grow also up the mountains to their highest elevations, and others of the mountains are washed down the streams to the lower elevations, especially by the waters of the San José River; so that such strictly mountain plants as Clevelandia, Heterotoma and others can sometimes be found in damp stream beds, but the great mass of the mountain flora is peculiar to the high elevations. The hundred and forty-eight species belong to a hundred and seventeen genera; the orders containing the greatest number of species are: Filices with sixteen, Rosaceæ six, Leguminosæ fourteen, Compositæ twenty-one, Caryophyllaceæ six, Orchidaceæ nine. The largest genera are: Desmodium with three species, Notholæna of three; several others have two, but most of them are represented by but a single species. Forty-two of the hundred and forty-eight grow also in Alta California and ninety-five

are found in Sonora, while seventeen are considered endemic to these mountain tops. These figures, when compared with the flora of the lower elevations, show a slightly larger proportion of endemic species.

	Number of Species.	Peculiar to the Cape Region.	Also in Northern Baja California.	Found in Mexico.	High Elevation.	Lower Elevation.
Ranunculaceæ	3	......	1	2	2	1
Papaveraceæ	1	......	1	1	......	1
Cruciferæ	6	1	5	3	3	3
Capparidaceæ	4	1	3	3	......	4
Cistaceæ	2	......	......	2	2	......
Violaceæ	2	1	1	1	......	2
Bixineæ	1	......	......	1	......	1
Polygalaceæ	6	1	4	4	2	4
Caryophyllaceæ	11	4	4	7	6	5
Portulacaceæ	7	......	2	7	......	7
Tamariscineæ	1	......	1	1	......	1
Hypericaceæ	2	......	......	2	2	......
Malvaceæ	22	2	17	13	1	21
Sterculiaceæ	6	1	3	5	......	6
Tiliaceæ	1	......	1	1	....	1
Malpighiaceæ	2	......	......	2	......	2
Zygophyllaceæ	7	......	6	5	......	7
Geraniaceæ	2	......	2	2	2	......
Rutaceæ	3	1	......	2	......	3
Simarubeæ	1	......	......	1	......	1
Burseraceæ	5	1	3	3	......	5
Olacineæ	1	......	1	......	......	1
Celastraceæ	1	......	1	1	......	1
Rhamnaceæ	4	......	2	4	......	4
Vitaceæ	3	......	1	2	1	2
Sapindaceæ	8	......	2	......	1	7
Anacardiaceæ	3	......	1	2	2	1
Leguminosæ	95	9	34	67	14	81
Rosaceæ	5	......	1	5	5	......
Saxifragaceæ	1	......	......	......	1	......
Crassulaceæ	2	1	1	......	......	2
Rhizophoraceæ	1	......	1	1	......	1
Combretaceæ	2	......	1	1	......	2
Lythraceæ	3	......	1	3	1	2
Onagraceæ	8	......	6	5	3	5
Loasaceæ	3	......	2	2	......	3
Turneraceæ	2	......	......	2	......	2
Passifloraceæ	1	....	1	1	......	1
Cucurbitaceæ	9	2	2	4	1	8
Begoniaceæ	1	1	......	......	1	......
Cactaceæ	16	3	8	11	1	15
Ficoideæ	4	......	4	4	......	4
Umbelliferæ	3	......	2	1	1	2
Cornaceæ	1	......	......	1	1	......
Rubiaceæ	15	5	3	9	2	15
Valerianaceæ	1	......	......	1	1	......
Compositæ	80	14	45	43	21	59

	Number of Species.	Peculiar to the Cape Region.	Also in Northern Baja California.	Found in Mexico.	High Elevation.	Lower Elevation.
Goodeniaceæ	1	......	....	1	.....	1
Lobeliaceæ	2	1	....	1	2	......
Ericaceæ	1	......	1	1	1	......
Primulaceæ	3	......	2	2	1	2
Ebenaceæ	1	1	....	......	......	1
Oleaceæ	1	......	?	......	......	1
Apocynaceæ	2	......	1	1	......	2
Asclepiadaceæ	10	......	7	8	......	10
Loganiaceæ	2	1	....	1	......	2
Gentianaceæ	3	.....	1	2	2	1
Polemoniaceæ	2	......	1	1	1	1
Boraginaceæ	14	......	9	10	......	14
Hydrophyllaceæ	2	......	•2	1	......	2
Convolvulaceæ	25	......	12	21	1	24
Solanaceæ	19	1	14	14	1	18
Scrophulariaceæ	14	1	8	10	1	13
Bignoniaceæ	2	......	1	2	.....	2
Orobanchaceæ	1	......	1	......	1	......
Pedaliaceæ	1	......	1	1	......	1
Acanthaceæ	17	4	9	8	1	16
Verbenaceæ	8	2	4	3	......	8
Labiatæ	13	1	7	8	4	9
Plantaginaceæ	2	......	2	2	2	......
Nyctaginaceæ	9	1	5	6	1	8
Polygonaceæ	4	......	4	3	1	3
Amarantaceæ	10	......	6	7	1	9
Chenopodiaceæ	7	......	7	6	......	7
Batideæ	1	......	1	......	......	1
Phytolaccaceæ	4	......	3	4	......	4
Aristolochiaceæ	2	......	....	2	......	2
Piperaceæ	2	......	1	2	1	1
Loranthaceæ	2	......	2	1	.....	2
Euphorbiaceæ	48	4	26	30	......	48
Urticaceæ	2	.....	2	1	......	2
Cupuliferæ	3	......	?	?	2	1
Salicaceæ	4	1	3	3	2	2
Coniferæ	1	.....	....	1	1	......
Orchidaceæ	9	......	1	9?	9	.....
Bromeliaceæ	1	......	....	1	......	1
Iridaceæ	2	......	1	1	1	1
Amaryllidaceæ	6	......	2	6 (?)	......	6
Liliaceæ	4	2	1	3	1	3
Commelinaceæ	5	1	....	4 (?)	......	5
Palmaceæ	2	......	1	1	1	1
Aroideæ	1	......	....	1	......	1
Lemnaceæ	1	......	1	1	1	......
Alismaceæ	1	......	1	1	......	1
Naidaceæ	2	......	2	2	1	1
Juncaceæ	1	......	1	1	1	......
Cyperaceæ	10	......	?	?	2	8
Gramineæ	52	2	29	43	8	44
Filices	22	1	5	21	16	6
	732	72	362	494	146	586

FOOD OF THE GROUSE AND MOUNTAIN QUAIL OF CENTRAL CALIFORNIA.

BY L. BELDING.

In autumn the grouse *(Dendragapus obscurus fuliginosus)*, of the Sierra Nevada at about seven thousand feet altitude, has a great variety of food as I have ascertained by dissecting many of them. The thimbleberry *(Rubus Nutkanus)*, appears to be its favorite article of diet, and next to this, the service berry *(Amelanchier alnifolia)*. Several kinds of wild currants and gooseberries, including *Ribes sanguineum* and *R. Menziesii* and red elderberries *(Sambucus racemosa)* are hardly less acceptable. Berries of manzanita *(Arctostaphylos pungens* and *A. Nevadensis)* and the mountain twin berry *(Lonicera conjugialis)*, the huckleberry *(Vaccinium occidentale)* and of the mountain ash *(Pyrus sambucifolia)*, are also eaten. The seeds of lupines, of *Polygonum polymorphum*, of the very abundant false sun-flower *(Wyethia mollis)*, of caraway *(Glycosma)*, and acorns of the dwarf oak *(Quercus chrysolepis* var. *vacciniifolia)*, add to the variety. The last two named are also eaten by deer and Indians. I have seen Washoe Indians have a pile of not less than thirty bushels, of nicely cleaned seeds of *Glycosma occidentale*. After the young grouse are hatched the mother bird takes them to alder and willow thickets where they find seclusion and water. Here they also find some insect food (which seems to be very necessary to young birds of most species), and a species of native red clover, the green leaves and heads of which supply them, for a time, with nearly all the food they require.

Old as well as young birds appear to be very fond of the mitrewort *(Mitella Breweri)*, which grows in these damp, shady situations. About the middle of August the females, with their broods, begin to change their haunts and range higher in the mountains, and then feed partly upon the foliage of fir trees *(Abies concolor* and *magnifica)*, and hemlock spruce *(Tsuga Pattoniana)*, the latter being apparently preferred. The old males feed upon the foliage of these conifers nearly all the year and during the winter when everything is covered with snow all grouse must subsist upon it.

Some years, late summer frosts destroy the berry and seed crops and then the grouse are limited to a diet of a few kinds of vegetable food, grasshoppers and other insects. One such year, during Sep-

tember, I found them feeding almost exclusively on the fallen dried male flowers of the yellow pine *(Pinus ponderosa)*.

After, about the first of October, these grouse go into the fir trees of the high peaks and are seldom seen. The game law which prohibits their being shot prior to this time is almost equivalent to prohibiting shooting them at all. The open season should begin about the middle of August, when young birds are about two-thirds grown, at which time they are a great luxury, whereas an old bird is no better than an old hen, if as good. Sportsmen, who are familiar with grouse, avoid shooting the adults.

The mountain quail *(Oreortyx pictus plumiferus)*, which are so plentiful in the high mountains in summer, are only summer residents there. They usually spend the winter below the snow line, but as it is not possible to tell just where that is, or rather where it is going to be, they are sometimes caught in snow storms, but I have been astonished at the correctness of their apparent forecast of different winters. A few birds winter high in the mountains, but I think they are parts of flocks which were nearly annihilated, or young birds which got scattered and lost, and a few that were wounded and survived.

They begin their journey on foot from the summit and east slope to the foothills, a little after the first of September, and by the first of October, when the game law allows them to be shot, they have nearly all escaped from the mountain hunters to run the gauntlet of those lower down, on the west slope. In some respects they are very stupid birds, in others, quite the reverse. When they are going from their summer to their winter resorts, birds of a flock can all, or nearly all, be shot if the flock can be turned from its course and scattered. They soon begin to call together and will nearly always respond to a hunter's imitation of their call. The loud pleasing call of the male in breeding season is not easily imitated nor described, though apparently consisting of a single note, which is sometimes varied a little. The service berry is the staple article of their food in fall, but they eat more or less of the different kinds of berries which the grouse eat. I suppose they, as well as the grouse, eat berries of the wild coffee *(Rhamnus Californica)*, but I have no data for a positive opinion. They also eat the acorn of the dwarf oak and seeds of the snow bush *(Ceanothus cordulatus)*, and seeds of many small plants. I do not know that they eat any of the

foliage mentioned as the food of the grouse, but they probably eat leaves of clover early in summer, just as valley quail do in winter. The juveniles eat a great many ants.

Some seasons, when there are no berries and very few seeds, they live almost entirely upon the bulb of a species of grass, apparently *Melica bulbosa*, which grows at the head of springs and rivulets. The birds get the bulb by scratching. Such seasons they start for the foothills sooner than when food is abundant.

ON A LEAF-MINER OF POPULUS FREMONTI.

BY C. H. TYLER TOWNSEND.

Almost every spring the cottonwoods in the town of Las Cruces, New Mexico, and its vicinity, are badly infested with a leaf-miner, which up to the present time has baffled all attempts at breeding. The cottonwood is our only native shade tree in the Mesilla Valley, there being only the one species, *Populus fremonti;* and as this insect has proven a serious pest to it, the following notes on the larva will probably be of interest, although the imago is unknown. A very brief notice of this miner was published in Insect Life, vol. 4, pp. 26–27.

It was found on April 30, 1891, that nearly every tree in the valley was most thoroughly infested, the majority of trees having almost every leaf mined out and blistered. The larvæ eat out the entire inner portion or parenchyma of the leaf, leaving the two skins whitened and inflated like blisters. They entirely and irrecoverably ruin the foliage of the tree, giving it a most desolate and dying appearance. The trees, however, gradually put forth a new set of leaves, and though they apparently soon recover their normal healthy appearance it is clearly evident that this process must be a great tax on their vitality. I have even been told that in some previous years the second crop of leaves has been likewise destroyed, but I cannot vouch for the accuracy of this statement. On the above date the larvæ were of several sizes, the largest being about seven-sixteenths of an inch in length. In general color they are nearly white, with some black dots on the anterior segments below and on the segments next the head above. Two larvæ were often found in one leaf, their mines beginning in separate parts of the leaf and gradually approaching until they coalesced.

Leaves containing larvæ were collected on May 4 of the same year, and put in a jar with earth to breed, but the larvæ all seemingly shriveled up and became hard and dried. At this date more than two-thirds of the larvæ had left the leaves.

The spring of the present year the leaves of the cottonwood had been out not more than one week when it was found, April 21, 1892, that they contained good-sized larvæ of this miner. It would therefore seem that the eggs must be deposited in the leaf-buds before the leaves appear, perhaps about the time the buds begin to swell.

On April 25 of this year, most of the larvæ were apparently full-grown, and accordingly a good number of small branches bearing leaves filled with healthy larvæ were put in a breeding cage, the branches being inserted in a receptacle which was kept filled with water. The leaves remained green and healthy for days, until all the larvæ had disappeared. The next day, April 26, a large number of the larvæ had already left the leaves, and were crawling on the earth in the bottom of the cage. They seemed to manifest a migratory instinct, and did not appear inclined to bury themselves at once in the soil. The migratory larva seems to lose the blackish dots on the anterior segments both above and below, and is entirely of a whitish color and somewhat shorter than before. Two or three of them were noticed going into the earth, but they were subsequently found perfectly hard and dried, and this was likewise the fate of all the others, which shriveled up and died on top of the earth within a day or two. They would not crawl under chips which were placed within the cage. All natural conditions had been carefully studied and provided, but to no avail. On April 29, the larvæ had all left the leaves in the breeding cage. Some very small larvæ were at work on April 25, along with the apparently full-grown ones.

Five of these miners were often found in one leaf this season, but the leaves of the trees were not so totally destroyed as in 1891. In one case even seven larvæ were found in the same leaf. They all begin separately, and work till their mines meet. The two skins of the leaves then become filled with the very fine black frass or excrement of the larvæ. They feed by day, and so far as observed always with the venter toward the upper surface of the leaf. They leave the leaf by making an incision in the upper skin just in the

edge of the blistered portion from which the parenchyma has been eaten, and next the latter.

A remedy for these miners is rather hard to suggest. Perhaps an arsenical spray about the time the leaf-buds begin to swell would kill the newly-hatched larvæ when they begin to enter the leaves.

Birds and chickens seem to destroy many of them after they have left the leaves and descended to the ground. On May 4, what were supposed to be pupæ were found in the earth under a cottonwood tree, and blackbirds were reported digging them out and eating them.

It is quite certain that this miner is lepidopterous, and it will probably be found to belong to the *Tineidæ*. It seems also that there is usually but one brood annually, and perhaps the pupæ remains in the earth until the following spring.

Below is given a description of the larva:

Full-grown larva of leaf-miner on *Populus fremonti:* Elongate, creamy whitish, with six pale brownish true legs. Twelve segments beside the head, legs 5-jointed, terminal joint small, conical. Head pale tawny brownish or testaceous, with a median posterior ventral brownish marking; mouth parts darker distally. First segment (next head) with a large oblong brownish marking situated in the middle, which covers about one-half of the dorsum of segment and is divided in the middle longitudinally by a faint median whitish line or suture, and also transversely through the middle by a suture which, however, does not show as a whitish line. A median pair of brown dots on dorsum of second segment. Venter of first segment with a large brown marking in middle, venter of second and third segments with a much smaller brown spot, and venter of fourth with a still smaller brown dot. Fifth to eleventh segments each with rudiments of a pair of pro-legs, appearing as very small buds on ventral surface defined anteriorly by a pale brownish usually semilunar marking. Anal tubercle brown or blackish, except terminal and dorsal surfaces which are whitish. Head fully three-fourths width of first (next) segment; second and third segments widest and also shorter than the other segments which are all of a nearly uniform length, except sometimes the fourth which is not quite so long. Segments four to twelve often exhibit (in alcoholic specimens) a continuous longitudinal median furrow on the dorsal surface.

In some specimens the dorsal markings of the first and second segments have disappeared, or are absent, and the legs have nearly lost their pale brownish color.

Length, about 9 mm.; width of second and third segments, 2 mm.; average width of following segments, 1.5 mm.

Described from alcoholic specimens.

NOTES ON SOME OF THE BUTTERFLIES OF THE YOSEMITE VALLEY AND ADJACENT REGION.

BY EDWIN C. VAN DYKE.

In the summer vacation of this year, I had the good fortune to be one of a camping party, traveling through the Yosemite Valley and adjacent regions in the National Park. During odd moments around camp or on the march, I found time to do a little entomological work, chiefly upon beetles and butterflies. It is of the latter that I wish to speak here, supplementing to some extent the article of Dr. Behr in Zoe, Vol. I, as well as that of Mr. Harrison G. Dyar in Entomological News, Vol. III, No. 2. In the region traversed, I had the opportunity of observing between forty and fifty species of butterflies, and concerning most of these I will here give the result of my observations.

Papilio rutulus Bdv.—Quite common in the lower valleys and meadows of the region, where it may be seen skirting the willow thickets or sporting around the flowers in the immediate neighborhood. Found in the Yosemite and Hetch Hetchy valleys and around Lake Eleanor. Never seen at a higher altitude than five or six thousand feet.

Papilio eurymedon Bdv.—Very plentiful also throughout the region, but prefers the open spaces on the hillsides to the valleys. Also often found flying at higher altitudes than the above. Most of the specimens caught were in a more or less tattered condition, which indicates that August is their last month in the mountains, at least for that brood.

Papilio daunus Bdv.— Several splendid specimens caught from July 23 to 26, in the Hetch Hetchy Valley, and several later on at Lake Eleanor. In both places they were caught while in the act of drinking.

Papilio zolicaon Bdv.—Often noticed on the ridges and tops of mountains, at altitudes not greater than eight or nine thousand feet. One was taken at the top of Sentinel Dome, July 11.

Papilio indra Reak.—Only one specimen seen. This crossed the Tioga road just ahead of us, when we were at an altitude of over eight thousand feet. The species is probably found at much higher altitudes than any of our Papilios, save in a few instances that of *P. zolicaon*.

Parnassius clarius Eversmann.—Quite common around the bogs and wet places, between Lake Tenieya and Tuolumne Meadows. The average altitude here is about nine thousand feet. In manner of flight they much resemble the species of Satyrus.

Pieris sisymbri Bdv.—Several of these were caught on the top of Sentinel Dome, July 11. They fly around while it is quiet, but seek shelter as soon as it begins to blow at all hard.

Neophasia menapia Feld.—Of this species I saw only about three specimens. They were in a yellow-pine forest on the south side of Lake Eleanor.

Anthocharis ausonides Bdv.—Several specimens of these, in a very fresh condition, were caught. They were found around the meadows in the lower altitudes.

Colias eurytheme Bdv.—Found about every meadow in the region, even up to ten thousand feet altitude. The albino female was also quite common.

Colias behrii Edw. — Only one specimen of this scarce butterfly was seen. This was disturbed from its resting place in the grass, while our party was crossing a small meadow on the side of Mt. Lyell. It is found on several of the high peaks around Tuolumne Meadows, as well as occasionally in the meadows themselves, but nowhere is it a common butterfly.

Danais archippus Fab.—Quite common up to an altitude of about six thousand feet, and is commonly seen sailing across small cañons or hovering over the milkweed. Several larvæ of it in different stages of development were also observed on the milkweed. The habits of the butterfly in the mountains do not seem to me different from those I have observed in the valleys.

Heterochroa Californica Butl. — Quite common in the valleys throughout the region. These butterflies have a curious habit of coursing up and down the roads and paths, much in the manner of large dragonflies.

Limenitis lorquini Bdv. — This species was found in about the same localities as the preceding. Neither of them were observed at higher elevations than six thousand feet.

Argynnis monticola Behr; *Argynnis zerene* Bdv. — These two species were always found together, the former being the most numerous generally. Very common through the mountains at altitudes below nine thousand feet. They delight in sunshine, and are

always to be found on open hillsides or other such warm spots. In view of the fact that I have found these two butterflies together here, as well as in Shasta county two years ago, it seems to me hardly possible that they are more than mere color varieties of the same species.

Argynnis leto Behr.—This handsome Argynnid was found quite often. It is a strong and rapid flyer, and is quite hard to capture, partly from the above cause and partly from its habit of flying around the wet places of the meadows. No females were observed by me on the entire trip.

Argynnis egleis Bdv.—Only three specimens of this high mountain form were captured. One was caught on the upper Tioga road, and the other two on the Lyell fork of the Tuolumne river. It strongly resembles *monticola* and *zerene* in its habits, though it is a weaker butterfly, flying slower and closer to the ground.

Argynnis epithoræ Bdv. — This, the smallest of the Argynnidæ found in that region, is quite common in the open regions of the high altitudes. In manner of flight this species much resembles a Melitæa or even some of the species of Satyrus.

Melitæa palla Bdv.—Found throughout the region traveled, up to moderate altitudes.

Melitæa leanira Bdv.; *Melitæa quino* Behr.—Only one specimen of each of these was captured. They were found July 9 on the north edge of the Yosemite Valley.

Phyciodes mylitta Edw. — Several specimens from different parts of the region traveled.

Vanessa antiopa Linn. — Several specimens observed. Most of them were at medium altitudes, though one was seen at the foot of Mt. Lyell at an altitude of about ten thousand feet. It ranges still higher, probably.

Pyrameis cardui Linn.—Very common, even up to high altitudes. This is one of our hardiest species, being often seen on some of the coldest and windiest ridges in the mountains.

Pyrameis carye Hbn. — Quite common, but not found at such high altitudes as the preceding.

Pyrameis huntera Fabr.—Several of these were seen around water courses in the lower valleys of the mountains. This does not appear to be quite as hardy a butterfly as either of the two preceding, though it is found quite late in the autumn, around the bay here.

Junonia cœnia Hbn.—Very common everywhere at low altitudes.

Chionobas ivallda Mead. — This butterfly probably reaches a higher altitude than any other butterfly found in the locality. I only captured one and that was at the base of Mt. Lyell, at an altitude of about ten thousand feet; but I have received some battered specimens taken from the Mt. Dana glacier, at a much higher altitude. This butterfly is a rapid flyer, being in this respect quite a contrast to the rest of the family of Satyrs.

Chrysophanus helloides Bdv.; *Chrysophanus arota* Bdv.—Several of both species seen several times in the Tuolumne Meadows and often in company with the following:

Chrysophanus cupreus Edw. — This beautiful little butterfly is quite common in the Tuolumne Meadows, especially in the bare and sunny spots on the hillsides.

Thecla melinus Hbn. — Only one specimen captured, at Lake Eleanor, July 27.

Thecla grunus Bdv. — Quite common on the Eagle Peak trail, coming out of the Yosemite Valley. Found about the oak *(Quercus chrysolepis).*

Thecla eryphon Bdv.—Quite common along the shores of Lake Eleanor.

Lycæna acmon Db.-Hew. — Very common in the lower altitudes of the district.

Lycæna battoides Behr.—Only one specimen captured here.

Lycæna sæpiolus Bdv.; *Lycæna rustica* Edw.—Very common in the Tuolumne Meadows, especially the former. Found congregated in great numbers along the margins of streams and ponds.

Eudamus tityrus Fabr. — Two specimens captured in the Tuolumne Meadows.

Nisoniades propertius Lint. — Several found in the same region as the preceding.

Besides the butterflies given above, I saw many other species which I did not get near enough to identify. The region as a whole is, however, a very rich one for a lepidopterist, and is particularly interesting to one interested in geographical distribution. Looking at the Yosemite region from this standpoint, one can see how similar it is to the rest of the Sierra region north of it. The only one of the above butterflies peculiar to this one district is *Colias behrii*, the remainder being either mountain forms peculiar to the

Sierra region in general or else cosmopolitan forms and those found everywhere in the State.

To the collector from the valley and coast regions of the State this region is a new world. Here he first comes in contact with large numbers of that family of Argynnidæ which makes the mountains seem so full of insect life. This is by far the best represented of any family in the mountains of this region, with reference both to numbers and to species. *Vanessa californica* slightly outnumbers it farther north, but is not seen in this locality. The genus Papilio is also better represented here than in the lower regions. The species of Thecla, Lycæna, Chrysophanus, Pieris and Colias are represented here as well as in the valleys. Parnassius and Chionobas are of course mountain genera, seldom found at low altitudes.

This short paper, with what has been done before by others, I hope will induce more collectors to explore the above district and try to clear up some of the difficult points. Very little has yet been done, but until this region is well explored our knowledge of what the Sierras contain will necessarily be limited.*

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*Most of these butterflies were named for me by Mr. J. J. Rivers.

A NEW RUMFORDIA FROM LOWER CALIFORNIA.

With Plate xxiii.

BY T. S. BRANDEGEE.

RUMFORDIA CONNATA. Perennial, herbaceous 1–2 m. high; stems clustered, much branched near the top, glandular-pubescent: leaves ⅓–1½ dm. long, ovate, acuminate, serrate, decurrent on the petioles as a broad margin and connate into a cup often 1–2 cm. in depth, more or less filled by the hirsute pubescence; nodes as long or longer than the leaves: panicle compound: heads long-pedunculate; peduncles slender, naked: heads 4–5 cm. broad; outer involucre foliaceous, deeply 5–8 lobed, its segments nearly equalling the rays, two of them usually much broader than the others and 2-toothed at apex; inner conduplicate about ¼ the length of the outer, green and glandular on the back, acute, and three times the length of the akene; receptacle convex, the paleæ membranaceous, obliquely obtuse, somewhat boat-shaped, loosely enclosing and twice longer than the akenes: rays ♀, numerous 15–18 mm. long,

equally 3-toothed at apex, and usually with two strap-like lobes at base, the slender glandular tube nearly half as long as the limb; disk flowers long-tubular 5-toothed: stamens long-exserted minutely sagittate at base: akenes glabrous, compressed, striate, oblique at apex, somewhat clavate, curved on the back and straight on the inner edge, crowned by a thickened ring; pappus none.

Highest elevations of the mountains of the Cape region of Lower California. Not very abundant, but conspicuous, making masses of bloom a yard or more in diameter.

The oblique compressed akenes, broader at the back, remind of Madia. The description is rather fully given because the plant does not entirely agree with that of the hitherto monotypic Rumfordia. It is, however, a fault which will readily be pardoned by any one who has had to delve among the brief and vague descriptions of too many of the Mexican Compositæ.

The figure in the plate is drawn one-half natural size.

A NEW EPILOBIUM.

With Plate xxiv.

BY T. S. BRANDEGEE.

Epilobium nivium. Perennial, pubescent, stems in tufts from a strong woody base: leaves oblong- or elliptic-lanceolate, pubescent on both sides 8–15 mm. long, narrowed to a short stout petiole, somewhat fascicled in the axils, the lower opposite, the upper usually alternate, all abruptly tipped with a stout subulate gland $\frac{1}{2}$–1 mm. long: flowers racemose in the upper axils; pedicels shorter than the ovary: calyx tube red or reddish, abruptly enlarged above the ovary, nearly linear 5–7 mm. long, $\frac{2}{3}$ the length of the petals; lobes spreading, at length deflexed, about 3 mm. long above the obconical throat: petals violet-purple, obcordate, 7–10 mm. long, twice the length of the longer stamens which are opposite the sepals and inserted a little higher in the tube; anthers apiculate: ovary few-about 8-ovuled; style equalling the corolla, the stigma with 4 short ultimately reflexed lobes: capsule somewhat fusiform, the few seeds being developed near the center; seeds immature, apparently smooth; coma dingy.

Collected September 25, 1892, at an altitude of 5,500 feet, on the

red shales of Snow Mountain, Lake County, in flower and young fruit.

In habit this species is strikingly like the narrower-leaved forms of the monotypic genus Zauschneria, and in conjunction with such species as *E. paniculatum* and *E. obcordatum*, make that genus untenable, there being no longer any definable and constant difference, however trivial, which can be used to separate them.

THE HABITS AND NESTING OF PALMER'S THRASHER.

(Harporhynchus curvirostris palmeri.)

BY HERBERT BROWN.

In offering these notes on the habits and nesting of Palmer's and Bendire's thrashers, I question much if I can say anything new in regard to the former, inasmuch as it has long been under the observation of experienced naturalists. The bird is a common resident of this portion of the Territory, and a notable feature of feathered life in every cactus belt in Southern Arizona. Some years since, I purchased a partial albino.* I first saw it as a fledgling at a ranch about forty-five miles west of Tucson, to which place the writer had gone as one of a rescuing party; the sheriff of the county, while endeavoring to arrest an Indian horsethief, had fallen into ambush and was himself a captive. The bird had been taken from its nest under the impression that it was a young mocking-bird. When I again saw it some six months later, it was fully grown, and appar-

*In general appearance it resembled *H. c. palmeri*. Poise and shape of head, length and curve of mandibles, bold, bright yellowish gray eye and movements those of *palmeri*, but the white markings gave it somewhat of a resemblance to *M. polyglottos*. If approached by a stranger when caged, it would ruffle its feathers, open its tail like a fan and peck viciously at the hand, but to its owner, a young fellow, whose both arms had been broken by an Apache bullet, it was all love and affection. The first, fifth and ninth primary in the left wing were white, sixth, seventh and eighth brownish gray, secondaries ashy gray, tertiaries white, stems of all white feathers black. Right wing, first and fifth primaries white, sixth brownish gray, secondaries first two white, the next four brownish gray, tertiaries first brown, second brown and white, third white, upper half of greater coverts white, eighth, nine and tenth all white. Tail—eleven rectrices entirely white, barred with faint waving lines of a darker color. Back, head and breast ashy gray, throat and abdomen white, upper mandible black, lower mandible from base to angle of gonys, white.

ently as domestic as the chickens with which it freely associated. Occasionally it would become too obtrusive and draw upon itself the belligerent attention of its more powerful companions, but when struck at, like the proverbial flea, it was never there. A dozen times an hour, and off and on I watched it for nearly half a day. I expected to see it killed, but its remarkable quickness always stood its friend. One pestiferous old hen would run up to within striking distance, then slowly crane her neck in the direction of the impudent little intruder, which also as suddenly assumed a like position, and for a moment they would stand defiantly eyeing each other, when, almost too quick to be seen, the hen would deliver her blow, but only to find the enemy two feet away with its head cocked first on one side and then on the other, apparently enjoying the dangerous sport. It answered readily to the name of Dick, and was particularly fond of a mixture of chili and corn meal, and when its attention was called to a cup containing some, it would be up in an instant, and if the vessel was covered with the hand would attempt to force its mandibles between the fingers. Failing in this, it would watch eagerly for any opening it could take advantage of. It had a penchant for digging holes in the ground; the harder the earth the greater its apparent delight. This odd feature, however, is common to the *palmeri* family at all seasons of the year, but more particularly, I think, while breeding. They press their tails firmly against the ground, after the matter of the woodpecker; if the earth be dry and sandy, a perfect fusilade ot dirt is kept up. The force of the blow is downward and towards the body, but occasionally to clean the sand out they strike several sideward blows, and dirt flies for a foot in all directions. In the early spring they are commonly seen with a hard lump about the size of a pea, attached firmly underneath the point of the lower mandible, and as the lump is of adobe, which at times is found a considerable distance from their resting places, it is evident that this digging is done for a purpose. During the winter months they leave the mesas for the more sheltered bottoms where they frequent the brush fences, pomgranate and willow hedge rows bordering the ploughed fields, and then, literally, they are in mud to their eyes.

Palmer's thrasher may never be classed as a musical prodigy, but nevertheless among Arizona birds he is rivalled only by that king of American songsters, *Mimus polyglottos*. Morning, noon and

evening, perched on the topmost branch of a cholla, he is always in tune, and while his notes may perhaps be less varied than his more favored kinsman, it is none the less bold and commanding, and but for the ubiquity of his rival in song would be in demand as a cage bird.

Southern Arizona, notwithstanding its great mountain chains, if viewed from an elevated position, presents the appearance of a vast plain that ends only where the horizon seems to touch the earth, with here and there a mountain range small in comparison with the surrounding plain, set down upon it. Between the mountains lie immense mesas and valleys, as a whole, timberless and waterless, but covered with nutritious grasses, great cacti belts and other vegetation of curious growth. Here, then, is the home of the *palmeri*, and in the cholla, beset with countless spines, it builds its nest and rears its young. This class of cacti, of which the foregoing cut gives but a faint conception of its terrors, is virtually impenetrable to man and beast. Ten million of cambric needles, set on hundreds of loosely jointed spindles, woven so closely together as to apparently defy the penetration of a body however small, but the thrashers go in and out and up and through them with the ease of water running through a sieve. In some convenient fork, on a limb against the bole of the bush, or in a cavity formed by the pendent stems of the plant, the nest is most commonly built. All the spines in the vicinity of the nest are pulled off for the better protection of the young. This does not, however, always save them as I have found them once in a while, tangled and dead in the terrible burs.

The external nest of the Palmer's thrasher is made of thorn twigs avergaing in length about eight or nine inches, seldom shorter but frequently much longer. Almost invariably they are lined with a species of wire grass, but sometimes thay go astray and use other material. In external depth the nests vary according to the whims of the bird and the requirements of the site chosen, but generally they average from seven to ten inches. The inner cavity at its greatest width near the top measures from four to four and one-half inches, bottom one-half an inch to an inch narrower, rounded or flat, and from three to three and one-half inches deep. However sparsely the walls of the nest may be lined, the bottom is always thickly padded with dried grass into which the eggs frequently sink one-half their depth, and in this condition hatch. There are, of

course, many exceptional nests. Some remarkable for the oddity of their construction, others for their bulkiness and still others for the flimsy manner in which they are put together. Have many records of such; a few instances, however, will suffice to show the peculiar ideas of the birds when they depart from their usual seven by ten building. One nest was built on the ruins of three others and probably represented as many successive broods, and gave the interior of the cholla the appearance of having been solidly filled in with dead sticks. Exterior diameter of the nest 20 inches, depth 36 inches, cavity across the top 4½ inches, bottom 3 inches, depth 6 inches, but lined only about 4 inches up with baling rope, hog bristles and grass. A second had an external diameter of 14 inches, depth 12 inches, interior diameter top of cavity 5 inches, bottom 2 inches and depth 9 inches, but lined with grass and feathers for two inches only, the other seven inches being naked sticks. The peculiarity of another was that the bird in leaving the nest went through a well built piece of cribbing rather more than ten inches deep, which stood at an angle of about 70 degrees with the top of the nest. The sticks forming the cribbing were from six to eight inches long and straight, the aperture was about four and one-half inches in the clear, being rather longer one way than the other. One edge of the cribbing lay solidly on the nest, the opposite side being open sufficiently to admit the body of the bird, giving the cribbing the appearance of having at some time been tipped from the perpendicular. I broke sufficient of the cactus burs away to expose the open side of the nest, then secreted myself to watch events. Both birds soon returned to the nest, but becoming alarmed again left apparently for good, but in the course of half an hour one again came back and was presently followed by the other. After a general inspection of the premises the female went on the nest, going in under the open edge of the cribbing, but on being approached left the nest by going up through the cribbing as she did when first disturbed. For a third time I saw her make her entrance and exit as described. The nest contained three slightly incubated eggs. In the spring of 1889 I noted several nests made almost entirely of flowering weeds. This came from the nature of the vegetation in the immediate vicinity of the cholla belt in which the nests were placed.

There appears to be no fixed time for the opening of the nesting

season, which alternates between the latter part of February and the beginning of April. At first I was inclined to attribute this difference to climate causes, but subsequent events modified my opinion in that direction. A cold winter followed by a late nesting led to the former belief, but a still colder winter and an earlier nesting upset my theory on that proposition. March 1, 1889, the young were already in the nests. February 28, 1886, my notes show two nests of three eggs each. March 28, 1887, is my first record. Although I had watched diligently for weeks and found many finished nests. March 3 opened the season for 1888 and March 15 for 1889, although the season was not fairly under way till two weeks later. The season of 1887 was characterized by the smallness of the clutches, two eggs as a rule being the maximum number laid, that of 1889 being marked by the other extreme, the complement being seldom less than three but more generally four. Although the season ot 1888 opened early in March it was not until March 12 that I visited the principal cactus belts within a radius of about twelve miles east and south of Tucson, and of the fifteen nests examined one contained two eggs; two, three eggs each; five, two young each, and two contained one young each. Three nests were apparently ready for eggs and two were in course of construction. The young in two nests were apparently ten days old and from that age they graduated down to the chipped shell. On the 18th I worked the cactus north of Tucson. I found one nest with two well developed young, one ready for eggs, one with one young fledged and sitting in the bush, two with three eggs each and one with one young, one about a week old. March 25 I partially covered the ground that I had been over on the 12th east of Fort Lowell, following down the Rillito a dry wash and a roaring torrent at different seasons of the year. The young had almost invariably left their nests and were sitting in the bush or running around with the old ones. The broods varied in size from one to three. The season of 1889 did not fairly open till the first week in April, when it opened with a rush, the birds being more numerous and clutches larger than on preceding years. April 3, I noted nine nests containing three eggs each; April 10, five of three; April 13, nine of four, twelve of three and two of two eggs each; April 14, two of four and eleven of three each; April 16, four of four; 17th, three of four and eleven of three; 27th, six of four and eight of three; 30th,

six of three and one of two. This practically closes the book for the year. It must be borne in mind, however, that the foregoing is given only to show the unusual size of the clutches and not as an actual representation of all the nests that came under my observation. The mesas and desert lands of Arizona are better than the macadamized road of the Eastern States for good driving, and, as they are generally level and everywhere accessible to a team, a large area of ground can be covered in one day. This fact partially accounts for the richness of the foregoing result for 1889.

NOTES ON SOME SPECIES OF THE GENUS ŒNOTHERA.

BY ALICE EASTWOOD.

Œnothera biennis L. The flowers of this common species expand about sunrise, not all at once as if they were opened by electricity, but one here, another there, and so on until all the fully developed buds are out. The style is shorter than the filaments, and fertilization takes place in the bud. On a cloudy morning they remain bright and fresh, but when the sun beats down with intense and undimmed rays, the petals are wilted long before noon. The var. *grandiflora* Lindl. has much larger flowers and stems less leafy. The style is larger than the filaments and before the bud opens is protruded from the expanding corolla, so fertilization in the bud is impossible. I have not observed insects flying around the open flowers or crawling within the corollas.

Œnothera pinnatifida Nutt. In the spring two classes of plants can be found; those that have evidently lived through the previous season and small plants that appear to be seedlings. The former soon become large with spreading habit, often forming a mat more than a foot in diameter. I have counted sixty-five large white blossoms on a single plant. They die when the seed ripens, unless growing near where the supply of water is permanent, when they appear to become perennial. They bloom in April and May, often lingering on through June and even occasionally into August. When there are rains in August, as there almost always are, a new crop of seedlings comes up which form simple-stemmed plants with a few flowers that remain until the frost. These plants are, in my opinion, the originals of the many stemmed plants of the next spring,

while the spring seedlings come from seeds that did not germinate the previous season, or perhaps from seeds ripened on the fall seedlings. These flowers open about sunset and are not fertilized in the bud, for the pistil greatly surpasses the stamens. I have examined hundreds of pods and have always found two rows of seeds in each cell, eight rows in all. The seeds are round and pitted.

Œnothera trichocalyx Nutt. Of this I have collected several forms that vary with reference to the bud, the appearance of which seems to be the chief difference between this and *Œ. albicaulis.* I cannot determine to which species several belong, though the Grand Junction *Œ. trichocalyx* and the Denver *Œ. albicaulis* seem quite distinct. They all have lance-linear seeds, grooved where they press against their companions, and often mottled with red. I found the mottled seeds on the Grand Junction form of *Œ. trichocalyx* and the Denver form of *Œ. albicaulis.* In both, the seeds of well developed pods have two rows in each cell. The plants from Grand Junction have buds that are conspicuously white villous and decidedly blunt; the tips are not in the least free This seems to be the typical form, as I said before, of *Œ. trichocalyx.*

The form from Thompson's Springs, a station on the Rio Grande Western in Utah, has villous buds that are acuminate but without free tips. I have the same from along McElmo Creek, in southwestern Colorado. The form from Moab in Utah has smooth buds, acuminate and with free tips. The form from Court House Wash, on the road to Moab, has buds slightly villous, with tips acuminate and partially free. These forms are all annuals or biennials.

The Denver form of *Œ. albicaulis* has sparingly villous pods, acuminate and with free tips. It would appear that a specific difference between these two must be sought in some other organ. *Œnothera albicaulis* is distinctively a perennial, but that might arise from its situation. It is always found not far from water, while *Œ. trichocalyx* inhabits desert regions.

In comparing the Denver *Œ. albicaulis* with the forms of *Œ. trichocalyx* I find the leaves to be quite dissimilar, the former having leaves that are either sparingly or deeply toothed and canescent with appressed hairs; the latter having pinnately divided smooth leaves with the segments narrow and linear. However, in looking over Watson's Revision, I find that var. *runcinata* and var. *Californica* of *Œ. albicaulis* have pinnatifid leaves; so the difference in the

leaves ought to have no weight. They both have white shreddy stems, *Œ. trichocalyx* being more frequently red than white. The flowers and capsules do not differ sufficiently to be marked. From all these considerations I feel compelled to believe that there is but one species instead of two. I have not had opportunities to observe the habits of any of these forms, but all are white-flowered and of course open in the evening.

Œnothera coronopifolia Torr. & Gray. Next to *Œ. biennis*, this seems most widely distributed. The flowers have a strong, sickening odor, and open before sunset. The style which is at first erect and longer than the stamens becomes declined as in *Epilobium spicatum*. It is not fertilized in the bud. The flowers remain open until nearly noon the next day and seem to gradually wither, changing from white to rose color. They are not quite an inch in diameter, and often there are several in bloom at once on the low but erect stem. There are two rows of seeds in each cell as in those of *Œ. pinnatifida*.

Œnothera cæspitosa Nutt., is the most variable of all the species, especially in its manner of growth, seeming to change so as to adapt itself to different conditions, or rather those that became best adapted prevailed and transmitted their qualities to the new generations. The form from Steamboat Springs in Routt county, Colorado, has pods on peduncles from a half-inch to an inch long. It is cæspitose. I have not seen the flower. The Mancos form is cæspitose from running root-stocks, with slightly angled sessile pods. The petals are deeply obcordate. At Grand Junction there are three forms: first, the typical cæspitose form; second, that with simple erect stem, the flowers in the axils and the dry stem of winter thickly covered with large ridged-winged sessile pods; and third, the intermediate, with stems branching from the base above ground, instead of underground, as in the Mancos form. The first is the common mountain form, the second is found at Pueblo and near Colorado Springs in the same kind of adobe soil in which it lives at Grand Junction. The axis of the two last forms is succulent, and doubtless holds a supply of moisture to ripen the fruit during the dry season that always follows the spring rains. The capsules are strongly winged and sessile. The flowers of this species are not fertilized in the bud. I watched the Mancos form and found that the flowers expanded almost at sunset, quite gradually but notice-

ably. The pistil was erect and protruded its viscid stigmas from the opening bud without a grain of pollen to be seen. The stigma lobes which were folded in the bud expanded as the corolla unfolded. Humming bird moths frequented the patches and flew from flower to flower almost as soon as they were open. The flowers were withered before noon the next day. They have a fragrance sweet and strong, so much like a lily that they are often so called. I suppose that the color too has something to do with the incorrect name.

One morning in June, after a frost the preceding night, I perceived, as I was riding along, an open flower with the lobes of the stigma closed. I had never noticed such a phenomenon before, and it impressed me as singular. I wondered if the frost had closed them after expansion or if the cold had prevented their opening. Did the stigma lobes come together to protect the naked stigmatic surfaces, or was it merely an accident?

Œnothera scapoidea Nutt., has two distinct forms which are both found at Grand Junction, sometimes even growing side by side. The small-flowered form blooms earlier than the other. The difference in size is marked, one having flowers an inch in diameter with protruding stigmas, the other with corollas less than a quarter of an inch across and stigmas included and fertilized in the bud. The pods and seed differ only in size but to a less degree than the flowers. Both have the red spots at the base of the petals and both have variable leaves. Generally they are entire, sometimes they have a few short irregular lobes at the base of the blade, and rarely have I seen them with margins irregularly sinuate toothed.

Œnothera cardiophylla Torr. Approaches so near to *Œ. scapoidea* that it is impossible for me to discriminate among the several forms which I collected this spring. The Grand Junction form has stems leafy along the branches instead of at the base; the leaves are oblanceolate, sinuate, dentate or entire, often with small irregular lobes below the blade. The flowers are very small and reddish, orange when they first open. The Moab form has all the leaves, except the bract-like upper ones, clustered near the root; the upper leaves are small, ovate and remotely dentate, the lower have from one to five pairs of small irregular leaflets on the long petiole. The pedicels equal the pod, but they vary in length in almost every plant. Another Moab form has all the leaves clustered at the base

of the stem, very villous canescent and similar in shape to the preceding form. In its general appearance it comes very near to *Œ. scapoidea*, and I regard it as an intermediate form. In Montezuma Cañon I found a similar plant. The pods are long and slender, twice as long as the pedicels.

I cannot find a constant characteristic among all these forms, but yet the forms that seem typical are not alike. All of the varieties of the (two?) species have two rows of seeds in each cell of the ovary. The impress of the eight rows can be distinctly seen on the pods of all my specimens.

There is an interesting feature common to the two forms of *Œ. biennis* and the two of *Œ. scapoidea*. Each has a large and small flowered variety, the former fertilized after opening and the latter in the bud. It is a subject for future study, and observations have not yet been sufficiently close and extended for theories or hypotheses.

NOTES ON SOME CALIFORNIAN CISTELIDÆ.

BY F. E. BLAISDELL.

Stenochidus gracilis Lec. Sparsely distributed throughout San Diego County. Frequents the blossom of *Adenostoma fasciculatum;* taken in net while at rest from various species of plants. The insect is black in color with basal portions of femora red.

Stenochidus cyanescens Lec. One specimen taken in May at Mokelumne Hill, Calaveras County. The genus is not exclusively Californian (*vide* Classif. N. A. Coleop., p. 390), as supposed by Drs. LeConte and Horn—it also occurs in Nevada (Casey). A black species; frequently the elytra have a bluish tinge.

Hymenorus inquilinus Casey. One specimen which I refer to the present species was taken from an agricultural ants' nest Sept. 24th, at Mokelumne Hill. The elytra are without impressed striæ, although the sutural lines are partly discernible. Color rufo-testaceous, humeral areas paler. Eyes black, front strongly convex, sparsely punctate and shining, epistoma abruptly flat and rather closely punctured. Prothorax short and slightly wider than elytra, the latter with sides straight and nearly parallel.

Hymenorus fusculus Casey. A number of specimens of this species were taken from a pile of decaying sunflower blossoms at Coronado.

Hymenorus macer Casey. Common at Poway, San Diego County, under debris, beneath trees and about decaying vegetables.

Isomira variabilis Horn. Moderately common at Poway during June and July on the blossoms of *Adenostoma fasciculatum.*

Cistela Thevenetii Horn. Moderately rare at Poway. Frequents the blossoms of *Adenostoma fasciculatum.* Color piceous-black to black, femora red.

LETTER FROM M. ALPHONSE DE CANDOLLE TO M. ERNEST MALINVAUD.*

GENEVA, July 6, 1892.

Dear Sir and Fellow Member:

You wish to know my opinion regarding the propositions issued by a committee of very competent botanists in Berlin, on the subject of nomenclature. I have signed the four articles which they propose, and I will tell you why.

In 1867, when we revised the collection of laws of nomenclature, we made omissions and committed several errors, which the march of science has now made obvious. We then thought almost exclusively of the future, scarcely at all of the first epoch in binominal nomenclature. We particularly said that it should start from Linnæus, without explaining from which of his works. But between the first edition of the Systema Naturæ (1735) and the author's last dissertation, published in 1776, a period of forty-one years elapsed, and during this long time his principal works were spread abroad (Genera, Species, Mantissa, etc.). At the same time descriptions of genera and species were published which are or are not sound, according as the nomenclature is based on this or that work of the master.

It is sufficient to cast a glance at the first folio edition of the Systema, now very rare, to be convinced that it is intended to make known Linnæus' twenty-four classes and not at all to define genera. It was in 1737, in the first edition of the Genera, that the author named and characterized the genera which he admitted. In 1753, in the first edition of the Species, he enumerated species under the binominal form. Not long since I was disposed to determine gen-

* Translated by Mary F. McRoberts, from the Bulletin of the Botanical Society of France, Vol. 39, meeting of July 8, 1892.

era from 1737 and species from 1753, but on this point the members of the committee of Berlin make a remark which is, in my opinion, very just. The real merit of Linnæus is to have combined for all plants the generic name with the specific term, which he did in 1753. That is, therefore, the chief date of the new nomenclature. Linnæus did not invent the designating of a species by two words. That is found in many books before his time. But it was an exceptional case, the greater number of species being named by phrases. If this plan had been continued the science would not have changed; there would only have been phrases, more or less lengthy, according as new species were discovered. Happily, Linnæus struck a successful blow when he instituted the constant and general employment of the binominal method as a fixed rule. Thus he is virtually the creator of this method, just as Ant. L. de Jussieu is of naming families, although many before him named and characterized these groups. Taking everything into consideration, it is a happy conclusion, that of deciding upon the date 1753 as the origin of modern nomenclature. That resolves the difficulty regarding the change of names, which the law of priority would entail had an earlier date been fixed upon. Strictly taken, 1752 decides the genera and 1753 the species, but taking into consideration the page which precedes the definition of species in the first edition of Species Plantarum, we see that Linnæus made use of the fourth edition of Genera Plantarum for determination of the genera, which he published in 1752.

The second proposition of the Berlin committee is in part our Article 46 of the Laws of Nomenclature, with useful additions regarding seminuda names, also regarding plates unprovided with descriptions of new genera. The third proposition conforms to the principle of the desirability of fixity of names. Finally, proposition four is a learned and impartial application of exceptions which it is possible to admit in the law of priority. Botanists will be pleased to see the desire to preserve such names as Oxytropis, Desmodium, Statice, Protea, Banksia, Myristica, Dendrobium and others, which an ill-chosen date or irrational interpretation of the law of priority threatened to change. The idea of making exceptions to that rule is not precisely a new one. Our Laws of Nomenclature (Article 4, and Commentary, p. 33) allow this to be seen. Thus the most just and best drafted laws, even in the civil code, are sometimes submitted to alterations which it is true ought to be rare and only caused

by necessity. At the present moment M. Kuntze's much to be regretted work involves just such a necessity. The Berlin committee understand this, and in the list of names to be rejected and names to be preserved, in spite of the law of priority, it has accomplished a difficult task, for which gratitude is due to it. Its propositions are a development of our laws of nomenclature, such as should be made when abuses crop in or when negligence is discovered in the compilation of 1867. I have myself given utterance to ideas of that nature, from which I hope good results, although the action of an isolated individual must always be slower than that of a committee.

Accept, dear sir and fellow member, the assurance of my cordial esteem. ALPH. DE CANDOLLE.

NOTES ON TWO MEXICAN SPECIES OF CEROPLASTES, WITH A RECORD OF PARASITES REARED FROM ONE.

BY C. H. TYLER TOWNSEND.

The two scales below mentioned have been sent to me by Dr. Alfredo Dugès, from the vicinity of Guanajuato, Mexico. To Dr. Dugès also is due the credit for the information given regarding food-plants.

Ceroplastes dugesii J. Licht.—Found at Guanajuato "more commonly on *Malvaviscus arboreus* Cav. and *M. acerifolius* Presl., two shrubs of about 3 or 4 metres height; and *accidentally* on adjoining shrubs." This is a large species, nearly white, sub-hemispherical, showing no division into plates, the white waxy secretion being very susceptible to pressure and filled with a watery liquid. Specimens kept dry for months do not lose this liquid in the least degree. Those sent measure in length, 9 to 11 mm.; width, 7 to 9 mm.; height, 5 to 8 mm.

Ceroplastes sp.—Found "on *Bignonia (buccinatoria?)*, and *Chrysanthemum* at Guanajuato." This is quite a different species in appearance. It considerably resembles *C. cirripediformis*, but is more than twice as large. The waxy secretion is not so white as in *C. dugesii*, but more of a dirty gray in color, not so soft, dryer, and is very distinctly marked off into plates, much resembling in general form the carapace of the box-turtle *(Cistudo)*. There is a dorsal, central, rounded plate, with a central black navel-like

spot; around this are grouped six other plates, two on each side and one at each end, the anterior end plate being the widest and bearing in a transverse row three central navel-like spots, the other plates sub-equal and with a single navel-like spot approximated to lower lateral margin; all the plates are marked with numerous very slight ridges radiating from the navel-like spot, the radiations being perfect on all sides from the center of the dorsal plate, and mostly upward and laterally on the others, the anterior end plate most approaching the central one in this respect. The specimens sent measure in length, 6 to 8 mm.; width, 4½ to 5½ mm.; height, 4 to 6 mm.

The specimens of this species were received from Dr. Dugès, on Sept. 27. On opening them, there were found to be present numbers of live adult flies of some species of parasitic microhymenoptera. Probably a dozen or more of these parasites escaped at this time. These all belonged to the more numerous flavous species. More of the same issued up to Sept. 29. The scales were not again looked at until Oct. 15, when a careful examination showed four different forms among the parasites, some of which had been issuing up to date. These were counted, showing the following numbers that had issued from 10 scales: The more numerous were the first or common flavous form, distinguished by the scutum of thorax being of a rufous tinge, and of which there were 22 specimens. Of a smaller form, which was black above and pallid below, there were 6 specimens. There were 3 specimens of a form more slender than the first one, and perfectly black except the wings. And finally there was a single specimen of a beautiful trypetid-like variegated-winged species, having the wings white with fuscous reticulations and the body marked in very much the same way. The flavous form was the only one noticed for the first few days, and the others must have issued much later. One specimen of the black species was found alive Oct. 15.

These parasites were sent to Mr. L. O. Howard for determination, and the following letter was received in reply:

"I am glad to get the specimens which you send, and it is interesting to know that all are bred from *Ceroplastes*. The yellow species, which occurs in the greatest abundance, is a species of *Aphycus*. It differs, curiously enough, from my *Aphycus ceroplastis* described in Bulletin 5 of this Division, and which was bred from

a *Ceroplastes* received from Silver City, N. M. I fully expected that your form would prove identical with this. The beautiful species which resembles a *Trypeta* belongs to a new genus of *Encyrtinæ*. We have the same species in the National Collection from California. The other species—the small black one—belongs to the genus *Tebrastichus*, and is a parasite not of the scale-insect, but of the *Aphycus*. It is a tremendous genus and the species are not worked up."

A SUPPOSED NEW FEATHER STRUCTURE:

BY CHARLES A. KEELER.

In examining a specimen of the Arizona hooded oriole *(Icterus cucullatus nelsoni)*, I observed what looked like fine black hairs sticking out among the feathers on the head and back of the neck. Upon extracting one of them, and examining it under the microscope it had every appearance of being a true hair. In reality it is probably a structure allied to the rictal bristles, but occurring in so unusual a place, and lying down upon the feathers instead of standing erect it has the appearance of being a different structure. Being unable to find any allusion to it I would propose, if it be indeed a new structure, that it be termed PSEUDOPILUM. They are present on the backs of the neck and heads of all the orioles I have been able to examine, and might prove to be a generic character. They also occur in both sexes and in the young, although most numerous in the adult male.

ON NUMENIUS BOREALIS IN CALIFORNIA

BY L. BELDING.

I think *Numenius borealis* published by Mr. Holterhoff in The Auk (vol. i, 4, 393), and referred to by Mr. Bryant (Zoe iii, 2, 165), was really *N. hudsonicus* and Mr. Holterhoff was mistaken in identifying his specimen. I was in San Diego not long after he published the note of its occurrence there and asked to see the specimen. He showed me a specimen of *N. hudsonicus* instead of *N. borealis*, and as there is no other known record of its capture in California, it is scarcely entitled yet to a place among Californian birds.

NOMENCLATURE OF PLANTS.

BY KATHARINE BRANDEGEE.

The Botanical Club of the American Association for the advancement of Science, which met this year on August 18, at Rochester, N. Y., appointed, on motion of N. L. Britton, a committee to consider the question of nomenclature and submit a set of recommendations to the club. The committee as appointed consisted of N. L. Britton, John M. Coulter, H. H. Rusby, W. A. Kellerman, F. V. Coville, L. M. Underwood and L. F. Ward, and on the following day submitted this report:

Resolved, That the Paris Code of 1867 be adopted, except where it conflicts with the following recommendations:

I. *The Law of Priority.*—Priority of publication is to be regarded as the fundamental principle of botanical nomenclature.

II. *Beginning of Botanical Nomenclature.*—The botanical nomenclature of both genera and species is to begin with the publication of the first edition of Linnæus' *Species Plantarum* in 1753.

III. *Stability of Specific Names.*—In the transfer of a species to a genus other than the one under which it was first published, the original specific name is to be retained, unless it is identical with the generic name or with a specific name previously used in that genus.

IV. *Homonyms.*—The publication of a generic name or a binomial invalidates the use of the same name for any subsequently published genus or species respectively.

V. *Publication of Genera.*—Publication of a genus consists* (1) in the distribution of a printed description of the genus named; (2) in the publication of the name of the genus and the citation of one or more previously published species as examples or types of the genus, with or without a diagnosis.

VI. *Publication of Species.*—Publication of a species consists* (1) in the distribution of a printed description of the species named; (2) in the publishing of a binomial, with reference to a previously published species as a type.

VII. *Similar Generic Names.*—Similar generic names are not to be rejected on account of slight differences, except in the spelling of the same word; for example, *Apios* and *Apium* are to be re-

* Amended Aug. 22, by inserting the word "only."

tained, but of *Epidendrum* and *Epidendron*, *Asterocarpus* and *Astrocarpus* the later is to be rejected.

VIII. *Citation of Authorities.*—In the case of a species which has been transferred from one genus to another, the original author must always be cited in parenthesis, followed by the author of the new binomial.

The main discussion upon this report was on Article VI, in regard to the acceptance of named exsiccati not accompanied by a description as valid publication of a species, which was discussed by Messrs. Beal, Coulter, Vasey, Swingle, Bailey, Kellerman, Barnes, Fernow, Cook, Dudley, Morong, Britton, Underwood and Johnson. The motion to amend by including exsiccati was lost.

Dr. Britton moved that a permanent committee be appointed to serve as a board of arbitration, and to prepare and print a list of the flowering plants within the area of the sixth edition of Gray's Manual in accordance with the recent report on nomenclature. It was subsequently agreed to to extend the range to include Canada, Nebraska and Kansas. On motion of Dr. Arthur the nomenclature committee was made the permanent committee for this purpose. A further motion was carried "that this committee be empowered to receive all suggestions and criticisms of this list, and to report upon them at the next year's meeting."

The action here taken is certain to have an important effect upon botanical nomenclature, in North America at least, as most botanists would be willing to make concessions in non-essentials for the sake of peace and uniformity. It is evident that such sacrifices were made in committee, as Art. IV of the principles set forth in the circular † sent out to American botanists did not appear in the report. This article, which received the signatures of four members of the committee, provided "That a varietal name be treated as equal in rank to a specific name, in its relations as a homonym and in the transfer of species and varieties from one genus to another."

The effect of this article would be to render the oldest specific name invalid in place of a still older varietal name. We have to thank the good sense of the committee for the shelving of this article, which would necessitate an absurdity in citation, and in view of the extreme looseness with which varieties are treated in bot-

† Zoe, iii, 170.

any—as equivalent to subspecies on one hand and to the slightest variation on the other—would lead to endless confusion.

Articles I, III, V, VI, VII, VIII will continue to be the practice, as they have been in the past, of most botanists.

Objections to Article II may readily be waived.

If Article V is rigidly enforced we shall be delivered from a lot of Rafinesquian trash—Agoseris for instance, where no type species is named.

The discussion on Article VI is somewhat surprising, as it is evident that some members of the club wished to make the issuance of exsiccati a valid publication. It might be endurable to so consider sets carefully prepared under competent superintendence and sufficiently numerous to allow at least one to each country, but a moment's reflection ought to convince anyone that sets as ordinarily distributed—in which only the sample, if any, has been submitted to authority—would be valueless for such a purpose, while the facilities for species-making, already too great, would be immensely increased.

And who should have authority to discriminate?

Article VIII, requiring the name of the original describer of a species to follow it in all cases, and in parenthesis when transferred to another genus, seems to us a great improvement over the old practice, which made no distinction between species described by an author and those merely, for any reason, written after another generic name—indeed offered a premium for as many changes as possible. The concluding clause, requiring the name of author of the last transference to be appended after the parenthesis, will probably be followed or neglected according to the fancy of the writer, as at present.

The rock ahead in these rules is the fourth article: the "Once a synonym always a synonym" provision. If this were intended as a rule for future guidance the objections might easily be overcome, though it would enable any mean-minded man—and some such have been known in botany—to prevent the commemoration of the name of anyone against whom he might have a grudge, by attaching his name to an invalid genus; but as a retroactive measure it will make chaos come again, unless—which it is idle to hope for—it could be left to the hands of careful monographers. It appears to us far better to let the matter of homonyms rest and devote the time spent

in discussions of them to a study of the organisms themselves, especially as such study may result in altering the bounds of genera and involving a new set of names, for perhaps few botanists, if they remember the mutations of genera in the last hundred years, largely due to our increasing knowledge, will consider that even their own efforts will be able to put nomenclature on a perfectly stable footing.

The annoyance arising from homonyms in synonymy is comparatively small, but as between zoology and botany they are a crying evil which overshadows all the others. Even so long ago as 1846, when Agassiz wrote the index to his Nomenclator Zoologicus he made the statement that the rectification of these names in zoology and as between zoology and botany would necessitate the sacrifice of almost half the generic names made in recent times, and it must be apparent to anyone that the inconvenience of writing concerning an insect feeding upon a plant of the same name is infinitely greater than that arising from the occasional revival of an old homonym, especially as by the recent tendency of science genera are more apt to be consolidated than divided.

The law of priority is apparently the only way of securing uniformity, yet it is repugnant to our sense of justice to reckon as of equal value in systematic science the work of careful and conscientious botanists and of the other far too numerous ones who, without herbaria or books of reference, record their vague descriptions, often identifiable only by the process of exclusion, in obscure journals or trade catalogues. There is no other branch of human knowledge which deliberately encourages incompetence.

We pay a dear price for uniformity when we have to accept such work as that of Necker and Rafinesque, and to dread the day when some Mexican may take it into his head to identify the plants of Hernandez' Historia Plantarum Novæ Hispaniæ, and give us some hundreds of names like *Tzonpilihuizpatli Tepuzcutullæ*, for instance.

A CORRECTION.—I included in the additions to True's Checklist (in this issue) a reference to Am. Rept. Dept. Agr. 1887, p. 435, as the place where the name *Sorex richardsonii* was revived. This is a mistake as *S. richardsonii* was revived, so far as I know, in Merriam's Geog. Dist. of Life in N. Am. (Proc. Biol. Soc. Wash. vii, April 13, 1892, p. 25.) The species referred to in Annual Report for 1887 is *S. Forsteri*, which should not appear in the list of additions as it is given in True's list. T.S.P.

INSECTS OF CATALINA ISLAND.

BY F. A. SEAVEY.

During the last week in August of the present year I spent part of the time in collecting insects on Catalina Island. As I know of no list of insects from this island having ever been published, I send one of my collection, incomplete as it is, trusting it might be of some interest in furnishing a new locality for the insects named:

Hymenoptera.

Apis mellifica Linn.
Emphor sp.?
Bombus Californicus Smith.
Bombus sp.?
Pompilus ferrugineus Say.
Pompilus tenebrosus Cresson.
Pompilus sp.?
Parapompilus sp.?
Augochlora pura Say.
Polistes aurifer Saussure.
Ceratina acantha Provancher.
Paratiphia albilabris Spinola.
Philanthus Californicus Cresson.
Vespa diabolica Saussure.
Bembex fasciata Fabricius.
Bembex nubilipennis Cresson.
Isodontia sp.?
Sphærophthalma sp.?
Sphærophthalma aureola Cresson.
Dipara sp.?

Coleoptera.

Balaninus obtusus Blanchard.
Anthonomus canus LeConte.
Pristoscelis quadricollis LeConte. From *Heteromeles arbutifolia*.
Carpophilus pallipennis Say.
Saprinus vitiosus LeConte.
Platynus brunneomarginatus Mannerheim.
Tropisternus Californicus LeConte.
Hyperaspis lateralis Mulsant. From *Artemisia Californica*.

Psyllobora tædata Leconte. From *Artemisia Californica.*
Chilocorus bivulnerus Mulsant.
Hippodamia ambigua LeConte.
Hippodamia convergens Guerin.
Coccinella sanguinea Linnæus.
Diabrotica soror LeConte.

HEMIPTERA.

Lygæus reclivatus Say.
Lygæus sp.? From *Verbena prostata.*
Orsillus scolopax Say. From *Verbena prostata.*
Nysius angustatus Uhler. From *Verbena prostata.*
Narnia femorata Stal.
Neathus vitripenne Stal.
Murgantia histrionica Hahn. From *Isomeris arborea.*
Platycotis sp.?
Kermes galliformis Riley.
Lecanium oleæ Bernard.
Lecanium sp.?
Aspidiotus convexus Comstock.

DIPTERA.

Volucella avida Osten Sacken.
Volucella esuriens Fabricius.
Volucella tau Bigot.
Copestylum marginatum Say.
Anthrax edititia Say.
Anthrax pretiosa Coquillett.
Anthrax sinuosa Wiedemann.
Lepidanthrax inaurata Coquillett.
Nerius sp.?
Ectyphus sp.?

ORTHOPTERA.

Scudderia Behrensii Bruner.
Œcanthus sp.?
Labia sp.?

NEUROPTERA.

Chrysopa sp.?

RECENT LITERATURE.

Reviews of Paleobotanical Literature.

BY THEO. HOLM.

A. G. Nathorst: *On the occurrence of fossil glacial-plants.**

It is nothing less than a mapping of the former distribution of the Arctic flora in Europe, that the author presents in these papers. They are principally based upon his own observations, and contain an invaluable account of the distribution of these plants. The accompanying map gives a comprehensive view of the former extent of the Ice-period in Europe, covering an area from 50° to 70° lat., besides Switzerland, a part of Hungary, Bavaria, Würtemberg, France and the Pyrenees.

The plants which especially indicate the presence of a former Arctic flora are: *Salix polaris*, *S. reticulata*, *Betula nana*, *Polygonum viviparum*, *Azalea procumbens*, *Saxifraga oppositifolia*, *Dryas octopetala*, besides some others, including mosses. The author presumes that several other species of *Salix* will be found by closer examination of the considerable material he has at hand, as there are some leaves which very much resemble *S. myrsinites*, *S. myrtilloides*, *S. retusa*, *S. Lapponum* and various others.

The fragments of these plants are not only leaves, but also branches, catkins and fruits. It will be interesting to know the conclusions which the author promises will soon appear from these investigations, concerning the former and present distribution of the Arctic plants. Some very interesting points have been given, however, in the present paper, concerning the distribution of *Dryas*. For the first time this has lately been discovered as fossil in Great Britain in a single locality near Edinburgh, while it is found in the living state among the mountains of Wales, Yorkshire and Scotland. *Polygonum viviparum* was found as fossil in Switzerland, but no fossil remains have ever been found of it in Sweden, although it is very common in the recent flora.

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*"Ueber den gegenwärtigen Standpunkt unserer Kenntniss von dem Vorkommen fossiler Glacialpflanzen." (Bihang K. Sv. Vet. Akad. Hdlgr. vol. 17, 1892; Stockholm, pp. 1–32, with map.) and: "Den arktiska Florans forna Utbredning i Länderna öster och söder om Oestergön." (Ymer, Stockholm, 1891, pp. 115–147, with map.) Also, "Fresh Evidences Concerning the Distribution of Arctic Plant during the Glacial Epoch." (Nature, vol. 45, Jan., 1892.)

The accompanying map shows, also, the former and recent distribution of *Salix polaris*, which, in connection with the other facts mentioned above, may give us important hints as to the migration of plants. It is to be hoped that Professor Nathorst will soon give us the promised work upon the distribution of these plants. And similar researches are highly recommended to the paleobotanists of this country.

FRIDOLIN KRASSER: *The Rhetic flora of Persia.**

It was not until the year 1858 that the fossil flora of Persia was investigated, when Dr. Goebel, as a member of the Khanikow-expedition to Chorassan, had the opportunity of making some collections in that country. These were studied by Dr. Goeppert. While Dr. Goebel collected in the province Asterabad in eastern Persia, visited Tietze, several years later, Hif near Kaswin and the mountain Siodscher, and Dr. Wähner made extensive collections on the Polak-expedition, discovering plant-bearing deposits near Rudbar and Sapuhin.

The Persian fossils from these localities occurred in a formation consisting principally of a greenish or sometimes reddish sandstone, the age of which, judging from the flora, seems to be identical with the Rhetic formation.

The author gives a complete list of works, published upon this Persian flora, the most important having been written by Goeppert, Polak, Schenk, Sturr and Tietze. He also mentions the most interesting fossil plants that were collected by the above mentioned explorers, and gives, finally, a full account of a very large collection, made recently by Dr. Rodler near Sapuhin at Kaswin, and presented to the Vienna Museum by the late Dr. Polak, court-surgeon of the Shah. It is especially from this last collection, that the age of the formation has been ascertained, and the specimens seem to give a more complete illustration of that flora, than any of the other Persian collections. We find in the list a few *Archegoniata: Equisetaceæ* and *Filices*. Among the genera of these families are *Equisetum*, *Phyllotheca*, *Asplenium*, *Bernouillia*, *Clathropteris* and others. The *Cycadeæ* are represented by *Podozamites*, *Otozamites*—of which *O. Polakii* is described as new to the science—and such genera as

*"Ueber die fossile Flora der rhätischen Schichten Persiens." (Sitzungsberichte d. K. Akad. d. Wissenschaften, Wien. vol. 100, 1891, 20 p.)

Pterophyllum and *Anomozamites.* Among the *Coniferæ* are found *Palissya*, *Baiera* and *Ginkgo.*

H. ENGELHARDT: *Cretaceous plants from Saxony.**

Such authors as Brongniart, Sternberg, Brown, Geinitz and Goeppert have already described the cretaceous Ferns, Cycads and Conifers from the locality near Freiberg, in Saxony, and Ettingshausen has treated the oldest dicotyledonous plants of the region in his paper: "Die Kreideflora von Niederschöna in Sachsen."† But since the year 1867, nothing of importance has appeared upon this subject. There is, however, in the Museum of the "Freiberg Bergakademie" a considerable collection made by Reich, which has been left partly unnamed, and it is upon this valuable material that the author has based the present paper. It contains an enumeration of plants with several critical remarks, and following are figured and described as new species: *Pterophyllum Reichianum (Cycadeæ), Salix Schoenæ, Triplaris cenomanica (Polygoneæ), Sapotacites Stelzneri, Mimusops ballotæoides, Chrysophyllum Velenovskyi, Sapindus saxonicus, Sterculia Geinitzi, Simaba saxonica* and *Leguminosites cretaceus.* The collection embraces, also, several very interesting types, and, although described before, we will note the presence of such characteristic forms as: *Delesseria Reichii*, *Didymosorus comptoniæfolius*, *Sequoia Reichenbachii* and *S. minor*, *Diospyros primæva* and *Liriodendron Meekii.*

C. T. BARTHOLIN: *Jurassic plants from Denmark.*‡

The present paper contains an enumeration of fossil plants, mostly collected by the author himself during his stay on the Danish island Bornholm. They all belong to the Jurassic flora, and represent the *Equisetaceæ*, *Marsiliaceæ* and *Filices.*

Sagenopteris Nathorsti is described and figured as new to the science. The author with some doubt has referred to this genus the fragments of some leaves which, if we consider the minute nervation, resemble somewhat the genus *Antrophyopsis.* There has, also,

*"Ueber Kreidepflanzen von Niederschöna." (Sitzungsberichte und Abhandlungen d. naturwiss. Gesellschaft Isis. Dresden, 1892, pp. 79–105. One plate.)

†Sitzungsberichte d. K. Akad. d. Wissensch. Wien. vol. 55.

‡"Nogle i den bornholmske Juraformation forekommende Planteforsteninger." (Botanisk Tidsskrift, Kjöbenhavn, 1892, vol. 18, pp. 12–28, plates 5–12.)

been described and figured a new species of *Laccopteris*, but the author has not ventured to name this supposed new species, since merely a very few specimens were discovered. This form seems to be related to *L. elegans*, but differs, however, by the considerably larger size of the leaves and the variation of nervation.

Hausmannia Forchhammeri apparently represents a distinct type. It has the appearance of *Jeanpaulia* very much in the shape of the frond, being stipitate and showing some divisions; but, the secondary nerves proceeding at right angles from the primary one, brings this form as to nervation closer to the genus *Clathropteris*.

The author calls attention to the fact that the leaves of *Hausmannia* show the same peculiar difference as does *Platycerium* of the recent. Concerning the arrangement of the sori, this new species agrees with *Clathropteris platyphylla*, in which they are scattered all over the dorsal face of the leaf.

The situation of the sori in relation to the nerves, was, unfortunately, not to be distinguished in the fossil. The plates contain several, well-drawn figures, with some details of all the species which were collected.

Third Annual Report of the Missouri Botanic Garden. The scientific papers are, first, A Revision of the American Species of Rumex occurring North of Mexico, by William Trelease. Twenty-three species are admitted and illustrated by as many plates, which though unecessarily reduced for the size of the page and deficient in detail will be found useful in dealing with this somewhat neglected group. In the second paper Dr. C. V. Riley brings together in accessible form papers previously published on "The Yucca Moth and Yucca Pollination," and describes six new species of Yucca moths *Pronuba synthetica*, *Prodoxus pulverulentus*, *P. y-inversus*, *P. reticulatus*, *P. coloradoensis* and *P. sordidus*. The ten appended plates are devoted to the different moths and details of oviposition and pollination. The paper is of much interest, but the author's argument that the Pronuba deliberately gathers the pollen from one flower and carries it to another with the view of fertilizing the flower and producing food for her young is somewhat of a draft on our capacity for belief.

The succeeding papers are: Notes and Observations on Yucca, with many good photographs and several detail drawings by Engel-

mann; a description of a new species of Agave *(A. Engelmanni* Trel.) and some notes with a plate on *Parmelia molliuscula.*

More than a third of the volume is occupied by reports of the annual banquets of the trustees and gardeners, and the annual flower sermon. Some of our English botannical friends are inclined to poke fun at this feature of the Report, and it must be confessed that a lot of bombastic after-dinner speeches do not combine well with scientific papers, but in fair justice it must be admitted that the authors of the scientific papers should not be held responsible.

K.B.

The North American Pyrenomycetes. By J. B. ELLIS and B. M. EVERHART. This book is an octavo of nearly 800 pages, with 41 excellent plates drawn by F. W. Anderson, whose early death we have had recently to deplore. Very little critical work has been done excepting in the Erysipheæ, which were elaborated by Prof. T. J. Burrill. Scarcely any attempt has been made to indicate the conidial and other stages of the species and the specific keys are of the slightest; as for instance in Sphærella, where the sections of the genus are given as:

A. Parasitic on leaves of dicotyledonous trees and shrubs.
B. On leaves and cones of coniferous trees.
C. On stems and leaves of dicotyledonous herbaceous plants.
D. On monocotyledonous plants.
E. On cryptogamous plants.

This may be as good a key as any, where the principal distinctions among the species appear to be the different plants on which they grow, with an occasional variation of a few micromillimetres in size, but this being the case the want of an index of hosts is especially remarkable. The volume on account of the large type and spacing is unduly large, and the plates though excellent are in many cases of species which have already been figured, and render the book too expensive for the masses, while to the specialist it is entirely unnecessary.

K.B.

Contributions from the U. S. Herbarium, vol. i, No. 5. This publication contains four papers. The first is a list of the plants collected by Dr. Palmer in 1890 on Carmen Island. *Drymaria diffusa*, *Desmanthus fruticosus*, *Passiflora Palmeri*, *Houstonia fruticosa*, *Brickellia brachiata* var. *glabrata* and *Euphorbia Carmenensis*,

the first three illustrated by excellent plates which I am glad to see are not folders, are described as new. The second paper—Plants Collected by the U.S.S. Albatross, 1887–91, along the Western Coast of America—is by various authors. J. N. Rose: Plants from Cocos and Galapagos Islands; D. C. Eaton: Ferns and Mosses from Southern Patagonia and Fuegia, with description of one new species *Bryum cœlophyllum;* A. W. Evans: List of Liverworts from Southern Patagonia, with descriptions of two new species, *Lophocolea apiculata* (pl. xv) and *Schistochila quadrifida* (pl. xvi); and a short list of Lichens from the same place by Dr. J. W. Eckfeldt. The third paper is a revision of the North American species of Hoffmanseggia by E. M. Fisher, and though marred somewhat by careless proof-reading is a valuable contribution. The study includes 17 species, two of them, *H. Texensis* and *H. canescens*, described as new and 9 new varieties are also characterized. One species, *H. intricata*, has suffered change of name, the older var. *glabra* being substituted for it, it seems to me, without due consideration. The writer fully agrees with the proposition that varietal names should be retained when a named variety is raised to specific rank—with one important reservation—that in no case is a specific name to be disturbed. For a varietal name can only claim priority as a variety, its specific date being that on which it was described as a species, any other course would involve the nomenclature in a series of false assumptions and absurdities. The author, for instance, finds himself unable to attach Watson's name to a species which he never named, yet inferentially appends his own, which can only date from the publication of his paper. As a matter of fact the name *glabra* was passed over for what appeared to be two good reasons. In the first place it is a pure and simple "nomen nudum," and if it were specific instead of varietal could only hold by the courtesy of a subsequent describer. In the second place Hoffmanseggia belongs to the category of unstable genera, being regarded as too near Cæsalpinia by Bentham, and unhesitatingly reduced to that genus by Baillon, and there is at least one older valid species of Cæsalpinia bearing the specific name *glabra*.

Another instance where the author's nomenclature seems to be at fault, according to his own rule, is in using *demissa* as a varietal name under *H. falcaria*, though by the synonymy given under it *H. densiflora* is the prior name.

The Systematic and Alphabetic Index of New Species, published in 1891, of North American Phanerogams and Pteridophytes, by Josephine A. Clark, which is the last paper, is one that every systematic botanist will find extremely useful, and we hope the other promised publications from the card list of the Botanical Division will soon appear. T.S.B.

Life Histories of North American Birds with special reference to their Breeding Habits and Eggs, with Twelve Lithographic Plates. By. CHARLES BENDIRE, U. S. Army (Retired). Smithsonian Institution. U. S. Nat. Mus. Special Bulletin No. 1, 1892, pp. viii, 1-414. Since the publication in 1857 of a single volume of the series begun by Dr. Thomas Mayo Brewer on the nests and eggs of North American birds no similar work has been attempted, if we except Ernest Ingersoll's financially unsatisfactory venture. The need of material both for the text and for figuring typical eggs has been a serious obstacle now removed by the matchless collection of Captain Bendire and the assistance rendered by others by contributions of new and more complete data relating to nidification supplementing the author's own extensive field experience. Doubtless there is no one equally as competent to deal with this subject as Captain Bendire who has, from time to time, in the pages of the Auk, biographically treated of several species in a manner that leaves but little to be desired. The work contains a few typographical, but self-correcting errors of proper names. The style is simple and clear. The text is decidedly not a compilation but remarkable for the amount of new reading that it contains, and one feels a confidence in accepting the facts as facts. The present volume, the first of the series, treats of 146 species and subspecies including the gallinaceous birds, pigeons and birds of prey. The text is not confined to descriptions of nests and eggs, but treats also of the life histories of each species, their geographical range, migration and food habits. The colored lithographic plates representing full sized typical eggs and variations are excellent, having been reproduced by Ketterlinus from the water-color drawings by Mr. John L. Ridgway. W.E.B.

The *Auk* for October has two photogravure plates of nests of the fish hawk accompanying an article on the "Breeding Habits of the Fish Hawk on Plum Island, New York," by Charles Slover Allen.

R. H. Lawrence contributes "Further Notes on Birds of the Gray's Harbor Region, Washington," with annotation on about forty species. "Birds of Southwestern New Mexico," by A. W. Anthony, has brief notices of 127 species and subspecies.

In General Notes, *Ereunetes occidentalis* is recorded from Connecticut; *Coccyzus americanus occidentalis* from Clarke County, Washington; *Vireo olivaceus* inhabiting British Columbia and Washington. Mr. Lucas makes an interesting item concerning the raising of English sparrows by electric light. This pest having been seen catching insects at night about an electric light and carrying them to their young. "Raising vegetables," he says "by electric light may be a good thing, but raising English sparrows in this manner is of more than doubtful utility." W.E.B.

In the *Scientific Memoirs* of Medical Officers of the Army of India, edited by W. R. Rice, Calcutta, 1892, part vii, we find five different papers on intestinal worms infesting horses, sheep and man. The first paper is by G. M. F. Giles on Some Observations on the Life History of *Sclerostomum tetracanthum* Diessing. This intestinal parasite is a strongyloid nematode closely related to *Dochmius duodenalis*, which infests the human system. *Sclerostomum tetracanthum*, is a small worm about half an inch in length, but as it occurs in enormous quantities—several buckets full having been taken from a single horse—it causes grave disorders and generally death. The disease caused by this parasite is in India known as "Surra," in Europe as epizooty, and appears to be prevalent at times in almost every county in the world.

Sclerostomum infests only the upper half of the large intestine, the ova only being dropped with the dung. The eggs develop only under the influence of rain and moisture, producing a tiny, white and semi-stransparent worm, the Rhabdite-stage of the parasite in question. These Rhabdite worms feed and live in the dung until they become sexually fertile when they proceed to grass and weeds. This transition can only be accomplished under the influence of rain or abundent moisture under any form. The mature male Rhabditis attains a length of 1.7 mm., two-ninths of the length being occupied by the body proper, the remaining seven-ninths consisting of a long hair-like tail. · The female Rhabditis attains a length of 2.25 mm., but is otherwise similar to the male. One or more generations are produced by this stage. Finally the ova of the Rhabdite

form gain access to the intestines of herbivorous animals, being swallowed with the green plants on which they feed. The embryos develop rapidly and finally encyst themselves in the walls of the stomach, cœcum and colon, and later on emerge as full grown Sclerostoma. *Dochmius duodenalis*, which is very similar to the Sclerostomes, causes the dreadful disease in man known as "Kala-azar" or "Beri-Beri." The best remedy to be administered are repeated doses of ½ oz. each of Thymol, 1½ oz. in all being sufficient to expel all the free worms, the treatment to be repeated when the cysts have developed.

In a subsequent paper in the same part Mr. Giles describes 3 species of Sclerostomes—*robustum*, *equinum* and *tetracanthum*, all infesting the horse.

Following this paper is one by the same author "On Nodular Disease of the Intestines in Sheep." In Assam and Burma the keeping of sheep is almost impossible on account of this nodular disease, the sheep dying off one by one in quick succession. This disease, also common in United States, is caused by a nematode worm, *Œsophagostoma columbianum* Curtice. The ova are carried away by the dung, hatch out in one or two days and become Rhabdites with short tails. They moult at least three times, and feed on green vegetation. Their eggs pass into the intestines of sheep, encyst there and later develop into Œsophagostomas. No successful treatment is possible and no prevention is likely to succeed. The Rhabdite forms exist continuously as free nemadotes and only await the opportunity to pass into the sheep. Stall feeding with steamed fodder appears to be the only prevention. G.E.

PROCEEDINGS OF SOCIETIES.

CALIFORNIA ACADEMY OF SCIENCES. *August 1, 1892.* President Harkness in the chair.

Donations to the museum were reported from S. Reubel, W. W. Price, A. W. Anthony, Dr. J. G. Cooper, John Carlsen, Frank H. Vaslit, W. O. L. Crandall, Agent S. P. Co., Indio, Cal., C. W. Knox, Frank H. Holmes, Charles Fuchs, Mr. Goebig, M. Braverman, E. D. Flint, J. W. Barry, Dr. Harkness, Charles A. Keeler, J. J. Kinrade.

The Librarian reported 187 additions to the library.

A paper by William W. Price on the Discovery of a New Grove of *Sequoia gigantea* was read by Walter E. Bryant.

A paper by Dr. J. G. Cooper on Land and Fresh-water Shells of Lower California was read by title.

The Secretary read a paper prepared by Melville Attwood on the advisibility of making an exhibition of Californian iron ores at the World's Columbian Exposition.

Dr. Harkness exhibited a living specimen of Amblystoma and made a few remarks concerning its metamorphosis.

Charles A. Keeler and Prof. W. E. Ritter discussed certain points in Romanes' theory of natural selection.

September 5, 1892. President Harkness in the chair.

Donations to the museum were reported from W. G. Blunt, Carlos Troyer, R. G. Stitt, Lieutenant Holcomb, E. W. Jones, Melville Attwood, R. C. McGregor, Miss Effie A. McIllriach, George B. Badger, Sidney M. Smith, Mrs. Nuttall, Mrs. Bush, A. W. Crawford, T. H. Hittell.

Twelve hundred and twenty-six additions to the library were reported.

E. W. Jones, by invitation, addressed the Academy on the subject of tin mining, explaining the methods used at the Temescal mine in working the ore.

Charles Fuchs made some remarks on *Phlœosinus dentatus* Say, which is ravaging the cypress trees.

September 19, 1892. President Harkness in the chair.

Donations to the museum were reported from C. H. and Dr. E. S. Clark, Henry Lorenzen, J. B. Haggin, James E. Requa, Carlos Troyer, G. P. Rixford, Mrs. A. E. Bush.

The Librarian reported 207 additions to the library.

Charles A. Keeler read a paper entitled Sexual Selection as a factor in the Beautiful in Nature.

October 3, 1892. President Harkness in the chair.

Anthony W. Vogdes and Oscar T. Baron were elected resident members.

Donations to the museum were reported from H. S. Nichols, Miss Effie A. McIllriach, Olaf Olsen, Dr. J. G. Cooper, Dr. L. D. Morse, M. Braverman.

Seventy-six additions to the library were reported.

Major J. W. Powell, Director of the United States Geological Survey, delivered a lecture on the Aboriginal Tribes of North America.

A vote of thanks was tendered to Major Powell.

October 17, 1892. President Harkness in the chair.

Additions to the museum were reported from F. A. Marriott, Jr., Mrs. C. A. Boland, Frank Miller, Dr. J. G. Cooper, Capt. Hultman, Geo. E. Twitchell and Thomas C. Johnston.

A vote of thanks was tendered to Mr. Thomas C. Johnston for his donation of a valuable ethnological collection from the South Sea Islands.

The Secretary read an announcement of the discovery by H. W. Fairbanks of *Proetus ellipticus* Meek, a trilobite from the Waverly Group, in Shasta County, California, identified by Captain A. W. Vogdes.

Lieutenant John P. Finley delivered a lecture on Phases of Pacific Coast Weather and Violent Local Storms, illustrated with stereopticon views.

A vote of thanks was tendered Lieutenant Finley.

CALIFORNIA BOTANICAL CLUB. *September 5, 1892.* Dr. Harkness in the chair.

The following were elected to membership: Miss Alice J. Merritt, Mrs. H. W. Hansen, Thomas Hatch, J. W. Blankinship, Dr. Ferdinand A. Hassler, Miss M. B. Harvey, Mrs. M. E. P. McCowen.

September 29, 1892. President Campbell in the chair.

Professor Douglas H. Campbell delivered a lecture on a Trip to the Hawaiian Islands, of which the following is a brief outline:

On first arriving in Honolulu one is struck by the great variety of tropical vegetation in the city. Of these tropical growths the palms are especially noticeable, the finest of all being the royal palm, *Oreodoxa regia*. Of the other showy plants the various leguminous trees with showy flowers were conspicuous, and of these the handsomest was *Poinciana regia*.

An examination of the shore region outside the city shows that practically none of the garden plants are indigenous, and that the vegetation native to the site of the city is very scanty. In the valleys back of the town, however, where the rainfall is very heavy, vegetation is abundant and varied.

The cane and rice plantations in the vicinity of the city, as well as elsewhere in the islands, are conspicuous features, and, with taro, constitute the staple crops. Cocoanuts are found everywhere near the sea, and banana and pineapple plantations are common.

Other fruits noted were oranges, mangoes, papayas, guavas and others less frequent.

Trips were made to Hawaii and Kauai, respectively the most southerly and most northerly islands of the group.

Attention was drawn to the great difference in the amount of rainfall upon different parts of the islands, especially upon the two sides of Hawaii. At Hilo the annual rainfall is 180 inches, and the vegetation in consequence extraordinarily luxuriant. Here the ferns reach wonderful development and the tree-ferns reach their full size and beauty. The ferns belong to much more diverse groups than in the United States, and all of the principal groups are represented.

On Hawaii the largest forests trees were met, but the variety is much less than on Kauai, which is much richer, especially in flowering plants.

The different geological age of the islands was referred to, Kauai being the oldest and Hawaii the youngest. Hawaii is, indeed, still in process of formation.

The islands being so isolated, and never having been connected with any other land have developed a most peculiar flora. Of the flowering plants and pteridophytes together almost 75 per cent. are strictly peculiar to the islands, while of dicotyledons the percentage is about 85, the highest known in any area of equal size.

October 17, 1892. The Vice-President, Mrs. S. W. Dennis, in the chair.

The following were elected to membership: Prof. W. R. Dudley, Mrs. R. F. Bingham, Mrs. R. M. Austin, J. H. Redfield, E. J. Buell, Prof. M. L. Seymour, Miss Emma Chismore, Mrs. Sophia E. Wilson, L. M. King, Christian Dahl, Dr. F. O. Jacobs, Miss Emma A. Shumway, W. A. Setchell, W. S. Lyon.

CALIFORNIA ZOOLOGICAL CLUB. *August 19, 1892.* The Vice-President, Walter E. Bryant, in the chair.

Mr. Bryant addressed the club on methods of preparing bird skins.

The charter roll was declared closed with this meeting.

October 1, 1892. Dr. Harkness in the chair.

Dr. O. P. Jenkins, of the Leland Stanford Jr. University, delivered an address on Recent Explorations in the Yellowstone National Park. The lecturer spoke in substance, as follows:

Despite the perpetual explorations of the Yellowstone Park by tourists, there is still much to be learned there from a zoological standpoint. Fish Commissioner McDonald has been especially interested in the Salmonidæ of the west, the trout, grayling and salmon, and much money has been spent in investigating the subject in this region. In 1889 Messrs. Jordan and Gilbert made a careful survey of the park for the purpose of determining the limits of the troutless area, which is situated in the Shoshone and Lewis Lake region, and includes the streams running from these two bodies of water. The explanation of this troutless area is not far to seek. The district in question is a greatly elevated volcanic region forming a high plateau, and the streams arising upon it invariably plunge down high falls. Accordingly, although trout are plentiful up to the falls they are unable to ascend to the plateau above. This elevated area is a beautifully timbered region, interspersed with grassy meadows affording ample feed for horses, and has now been well stocked with trout by the Fish Commission.

In 1891 I was sent with Prof. Evermann, of the Fish Commission, to this locality to see how the trout which had been left there were doing, and to see what other streams in the region might be stocked to advantage. A fine opportunity was also presented to work out an interesting problem in the geographical distribution of the trout of this district. We started from Two Ocean Hotel, with a pack train of eighteen horses and complete outfit, for Two Ocean Pass, a pretty meadow valley of high elevation, from which flow a number of streams, some ultimately reaching the Atlantic and some the Pacific system of water courses. The trout in the two water-courses had been considered as two species, but Dr. Jordan, after an examination of a large series, pronounced them to be the same. An examination showed that one Atlantic stream had piled up a gravelly bank and the water had been dammed up so that by the removal of a few stones a strong stream ran off towards the Pacific creek Trout were found on both sides of the divide in this instance. Near at hand another stream was found, which could be made to flow in both directions from the divide by diverting its channel at a slight bend, and allowing the water to flow up one arm and down the other of a sort of Y.

The bull-head, blob, or miller's thumb, as it is variously called, is found in this troutless area above the falls, especially in the Gib-

bons River. Strangely enough no blob are found in Yellowstone Lake or River, which are alive with trout. Why it should go where it apparently could not get, and did not go where it might easily have been, is indeed a mystery. Geysers occur at various points near the shore of the Yellowstone Lake, where there is a sudden contrast from ice cold to boiling water. Trout may be caught and cooked in the same body of water, almost without stirring from one spot. In fact, not unfrequently they swim into a geyser unawares and are speedily killed. All these trout of the Yellowstone Lake and River are infested with a parasite—a cestode worm. It sometimes lodges in the abdominal cavity, sometimes in the pyloric cæca or intestines, but most frequently in the muscles. For some time we were unable to understand how it was that the trout of the Yellowstone Lake were thus infested, while those of Jackson Lake were not, but the explanation was at last found. The California gull and white pelican are hosts of the adult form of this parasite, which lives in their intestines. The eggs of the worm, when voided by the birds are eaten by the trout, and developing there into the larval stage burrow into the muscles of the fish.

In an interesting stream known as Crawfish Creek no fish were present, but an abundance of crawfish (*Cambarus ambellis*). Grayling were restricted to Firehole River and Gibbon River, which flow together. The temperature of the water makes a great difference in the size of trout, an extremely cold temperature retarding growth, and it is on this account that most of the Yellowstone trout are comparatively small in size.

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Aurelius Todd, Eugene, Oregon.
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Charles H. Townsend, U. S. Fish Commission.
Prof. C. H. Tyler Townsend, Las Cruces, N. M.
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NOTES.

The Journal of Botany for July says: "British botanists, especially London ones, will regret to learn that the introduction of plants into localities where they may become established is being carried on with considerable energy by a member of a London Natural History Society. Hampstead Heath and Keston Bog are two of the places where this pernicious and unscientific action has occurred; and *Parnassia* and *Pinguicula vulgaris* were planted in the New Forest bogs by the same individual. In this case it was possible to nullify the attempt; but the precautions then taken may be easily evaded, and it is to be feared that in some cases the imposition may be successful. We trust that the society referred to will take steps to disassociate itself from so disreputable a proceeding."

Unless there is more in this note than meets the eye of a casual reader it is difficult to see why the writer objects with so much vigor. Nature aided by the peregrinations of man diffuses many of the unsightly and objectionable of her plants pretty widely, and if no attempt is made to deceive, why should not the ornamental ones go visiting also? We would hold that man a benefactor who would vary the prevailing yellow of our autumn fields by the beautiful New England Aster, make our swamps acquainted with the Osmunda and the Side-saddle Flower, or hide in our forests the Indian pipe.

Prof. W. R. Dudley of Cornell is expected in California in December to take charge of the department of Phanerogamic Botany at Stanford University.

Miss Faustina Butler, in charge of the World's Fair exhibit of California Wild Flowers, would be grateful for seeds, bulbs, etc., of our showy wild flowers. Address, care of World's Fair Commission, Flood Building, San Francisco.

Miss E. Cannon, 1402 Bush St., San Francisco, wishes to dispose of her herbarium of named Californian plants; some hundreds mounted on large-sized sheets, but the greater part unmounted.

Botaniska Notiser, 1891, Part 4, 174, has the following note upon *Cystopteris Bænitzii* Dörfler: "According to Botan. Centralblatt 1891, nr. 25, pp. 333–4, there is to be found in C. Bænitz's Herbarium Europæum under nr. 6,510 a new Cystopteris species distributed and described under the name of *C. Bænitzii* Dörfler. While the spores of *C. fragilis* Bernh. are closely covered with pointed teeth, the new species possesses spores which are perfectly smooth without signs of teeth, only here and there furnished with isolated irregular, folded ridges or 'combs.' The specimens were found on slate rocks in the vicinity of Kongswold Dovre in Norway. The species is besides only known by its namer from San Bernardino in South California. Among the many specimens in the herbarium of the Lund University no one agrees with the above description except one with the following: '*C. fragilis* lobulato-dentata Wilde. Elstad, in crevices close to a small brook 3/7, 1865, A. Falck.' Elstad is situated in Gudbransdalen. The value of this new species must be decided by future investigations."

If species of ferns are to be founded upon markings of the surface of the spores a fertile field is prepared for the species maker. The numerous specimens of *C. fragilis* in the herbarium of the California Academy of Sciences show every gradation of spore markings, from mere irregular reticulations to the ordinary echinate form. One example from Santa Clara County is covered with irregular warty projections. Specimens from Rhode Island and from Hawaii agree exactly with the description of *C. Bænitzii*, and others from Sierra Mojada, Colorado, are both reticulated and echinate.

The Harvard Herbarium has been reorganized under the name of the "Gray Herbarium of Harvard University," in charge of Dr. B.

L. Robinson, Curator; Henry E. Seaton, Asst. Curator; Merritt L. Fernald and J. A. Allen, Assistants. Much good work may be expected from this group of young and active men, succeeding to the richest herbarium and best botanical library in America, and inheriting from their great predecessors traditions of moderation which may influence the too violent tendencies of nomenclatural reform.

Mr. William T. Davis, writing in Bull. Torrey Club, xix, 301, about a patch of oaks on Staten Island, names one which he considers a hybrid, *Quercus Brittoni.* It will be interesting to observe how persons who act in such wise, propose to distinguish these names from those of valid species. Gardeners, of course, give names to the multitude of hybrids and sports which they produce for trade purposes, but such names are usually of a fanciful form, and botanical science takes little cognizance of them. Our friends, the zoologists, are evidently neglecting their opportunities. How long the army mule, for instance, has led a miserable existence for want of a specific name, yet it is too be feared that if some fervent "disciple" of any eminent zoologist testifies admiration by attaching his name to the long neglected quadruped, the well meant effort will hardly receive the thanks of the complimented.

ERRATA.—In article on Balanoglossus, Ritter:

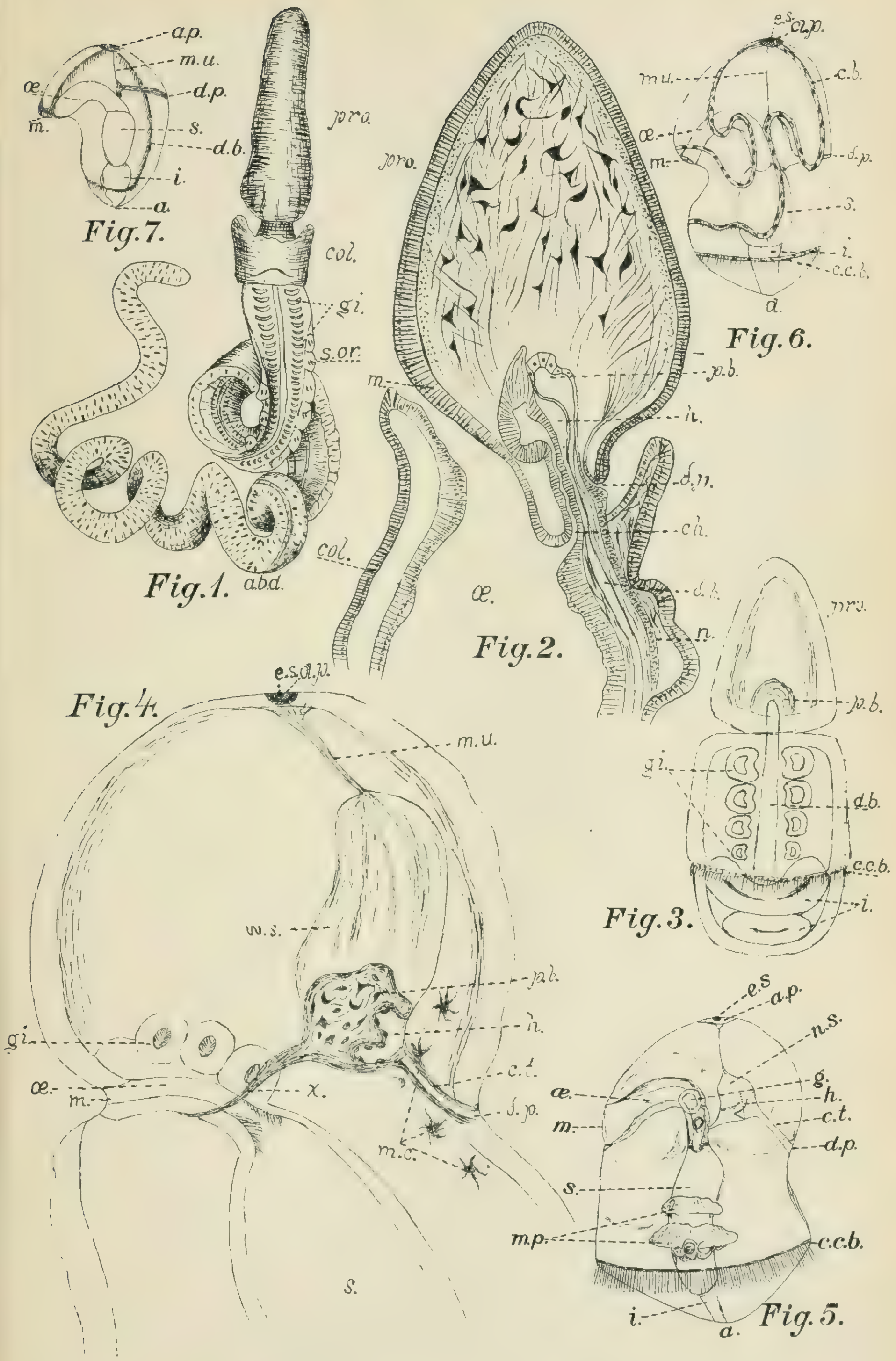
Page 190, line 21, for "flow" read "flows."

Page 197, line 34, for "sink" read "sinks."

Page 200, for "Fig. 6" read "Fig. 7;" and for "Fig. 7" read "Fig. 6."

In "List of Abbreviations," for "*v. b.* Ventral blood vessel" read "*w. s.* Water vesicle."

On Plate xxii, Fig. 5, for "*n. s.*" read "*w. s.*"



BALANOGLOSSUS.

RUMFORDIA CONNATA

EPILOBIUM NIVIUM

ZOE.

A BIOLOGICAL JOURNAL.

VOL. III. JANUARY, 1893. No. 4.

Recd. 14 ...

CONTRIBUTIONS TO WESTERN BOTANY. No. 3.

BY MARCUS E. JONES.

CAULANTHUS CRASSICAULIS Watson, is perennial. The four stamens are declined and close pressed to the lower petals, and the two others are as tightly pressed to the upper petals, after the fashion of the Labiate stamens. This grows in loose soil in alkaline valleys as well as in better-drained localities with little alkali. It blooms mostly in the month of May, and is common in Western Utah as well as in Nevada.

STANLEYA VIRIDIFLORA Nutt. The very imperfect description of the type in Coulter's Manual, King's Report, and the better one in the Flora of North America, Torrey and Gray, make it uncertain whether this plant is a new species or not. The salient points of the type are the simple stem, erect and glabrous, leaves cuneate-obovate ("obovate or lanceolate," Watson in King's Rep.), entire or few toothed at base of stem, upper ones rapidly reduced so that the upper stem is nearly naked, entire ("lanceolate, sessile, clasping," Watson l. c.); raceme long and crowded with flowers, which are greenish yellow, with linear sepals and petals, anthers very long and linear, pedicels ½ inch long, stipe an inch ("½ inch," Watson l. c.); long and narrow torulose pod. Said by Nuttall to grow on shelving hills, and apparently by Watson in valleys.

My plants, of which I have a large suite gathered at different places, and which I carefully studied as they grew, are short-lived perennials (3 years old at least), with stems all ridged and more or less winged throughout, the wings sometimes about a line high; leaves lanceolate, barely acute and entire, but with two rounded lobes at the truncate base, root leaves pseudo-petioled and wing margined, as also the lower stem leaves, 6 to 12 inches long and ¾ inch wide, thick, leathery, and light green, smelling like cabbage,

stem leaves rapidly reduced upwards, sessile, apparently (but not) clasping, uppermost ovate to sagittate, or hastate, acuminate, the rounded or almost acute lobes 3 to 4 lines long, petioles of root leaves grooved; spikes sessile and in the fully developed plants many branched; the central branch long, 1 to 2 feet, densely flowered; sepals in the bud greenish yellow, after anthesis purple (usually) and reflexed, linear-oblanceolate, obtuse, concave, almost hooded; blade of petals crumpled crosswise, edges jagged, linear, ½ line wide, yellowish green, inconspicuous, 4 to 6 lines long, and thin, claw thick, fleshy, triangular subulate, 6 lines long and a line wide at the saccate base, glabrous, whole petal just equaling the filiform filament, which is round, glabrous, and scarcely enlarged at base, anther loosely coiled 2½ lines long, obtuse, narrowly linear, fixed by the very base and one-sided; pedicels in flower 2 lines long ascending and in fruit 4 lines long and horizontal; pods drooping, 2 to 3 inches long, stipe 8 to 10 lines long, septum less than ½ line wide. It grows among pinons and cedars on gravelly southern slopes of hills at 6,500 to 7,000 feet altitude in the Schell Creek and Sprucemont Ranges, Nevada, and flowers about July 15 to August 15. The greenish yellow sepals are rather conspicuous. It is not very common. It differs from the type so far as the descriptions go in the winged stems, branching habit, crumpled petals, auricled or hastate upper leaves, and longer pendent pods. But it may be that these characters were overlooked in the type. Should this plant prove to be distinct it may bear the name of *Stanleya collina*.

LEPIDIUM HETEROPHYLLUM. I propose this name for the *L. montanum* var. *alpium*, Watson, King's Rep. and *L. integrifolium* var. *heterophyllum*, Wat. Am. Nat., IX, 268. I fail to see anything warranting the connection of this shrubby based, cliff-growing, decumbent, high altitude plant with *L. montanum* or the alkali-loving *L. integrifolium* of the valleys. It reaches an altitude of nearly 9,000 feet in the Wasatch and shows no gradation into either species either in habitat or character so far as I know.

POLYGALA ACANTHOCLADA Gray. It may be of interest to give the characters of the flowers of this plant as they are in nature and not in dried specimens: Green parts of calyx 3, ovate, barely acute, 1 line long, the two upper (this is as the flower appears on the plant with the keel uppermost) close together, lower one alone, the two

petal-like ones obovate-oblong, widely spreading, cucullate, barely acute, 2 lines long, ascending, white; keel truncate, 1½ lines long, 1 line wide, broadly obovate, greenish; banner oblong-linear, expanded at end and rhomboidal, erose and notched, greenish, tip purple with veins running down ½ line, 2 lines long in all. The keel has an oblong orifice with the lips turned back at more than a right angle; stigma truncate or club shaped and included in the hood; pod oblong ovate, 2½ lines long and 1½ wide, deeply notched. The plant is a shrub 1 to 3 feet high, with gray bark and stems often an inch thick, widely and rather intricately branched and spiny. Gravelly hillsides in dry places. I have collected it at Lee's Ferry on the Colorado River near Southeast Utah, and found it common in Western Utah and Eastern Nevada.

VIOLA BECKWITHII Torr. The description of this plant in King's Rep. is inaccurate, but the figure, etc., in Beckwith's Rep. are better. The following are the characters of our plant as it grows here; it is locally abundant. Stigma cuneate and truncate, glabrous, petals also glabrous, 2 upper ones dark purple, the rest white with a yellow claw and purple veined, lower petals broad, truncate or emarginate, flowers rather large; sepals linear oblong, spur not over a line long; pubescence minute and dense; leaves 3-divided, divisions petiolulate, lateral ones 3 to 6 lines long, terminal ones 6 to 12 lines long, lobed or cleft into many linear or oblong segments.

LUPINUS SULPHUREUS Douglas. This little known plant I discovered growing abundantly in Eastern Nevada, and I think it is quite probable that it will be found to be nearer *L. sericeus* than has been supposed. My notes on the flowers were taken as they grew. When the flowers are just opening they are white with a yellow streak in the middle of the banner, which is also flecked with 4 or 5 small purple spots; the whole flower soon turns yellow, the middle of the banner deeply so. The calyx is long-spurred, spur and all but the tip of the upper part of the calyx white and streaked with blue, the lower part of the calyx and tips green. It grows 1 to 2 feet high, in clumps from a hard woody root, on gravelly slopes, flowering in June. I have a very few specimens with a suspicion of blue on the banner.

PSORALEA CASTOREA Watson. As I suggested in a previous note (No. 2) this includes *P. mephitica* Watson. A careful compari-

son of my many specimens from Southern and also Eastern Utah and Colorado shows that the distinctions relied upon by Watson to separate the two species are valueless, while the "mephitic" odor was doubtless due to the animal rather than the vegetable kingdom.

The following characters will fit my suites of specimens. Leaves 1½ inches long, from rhomboidal obovate to spatulate, acute, apiculate or retuse: stipules persistent or caducous, the larger ones 1 inch long, ovate, obtuse, and persistent, the smaller ones ⅓ inch long, ovate-lanceolate, abruptly contracted into a long acumination and caducous; stems none to 4 inches long; petioles 2 to 6 inches long; peduncles shorter than the leaves; bracts ovate, scarious, obtuse to abruptly contracted and with a long acumination, equaling the scarious, inflated calyx and blue and white petals; calyx lobes linear to lanceolate, acute or long acuminate; spikes 1 to 3 inches long; peduncles 1 to 4 inches long and stout; pods lanceolate, glabrous below the middle and long villous above it; roots very deep and apparently tuberous, but really woody and all connected underground; whole plant densely pubescent, with short or long hairs, upper side of leaves less so or glabrous. Grows in patches either in sandy places or on rocky slopes in dry places; flowers in May.

ASTRAGALUS. Doubtless many have had much difficulty in determining species in this genus from the flowers alone; at least I have found it exasperatingly so, and, as the pods are often not to be had when the flowers are seen, and as the flowers have been almost ignored, I began some years ago to study the flowers with a view to determine if they had any specific value, and with good results; how good cannot yet be determined fully.

I find that the arching of the banner and its shape are valuable, the shape of the sulcus in the banner, the shape of the white spot on the banner in a general way, and the backward folding of the sides of the banner are valuable; the shape and length, as well as the position of the wings, are valuable. Often the wings are concave to the keel or flat, horizontal, or arched upwards, connivent over the keel or with the blade edgewise to it, and so like the outspread wings of insects. The shape of the keel, its arching and tip, are also of value in separating species. I find little or no difficulty in separating species by these characters in conjunction with the leaves. Whether they are of value in making sections I doubt,

but they are good in making smaller divisions, where now we have considerable difficulty. I hopê Californian and Northern botanists will report on these things with their species. It is necessary to take the notes on flowers when they are growing, and as soon as they are fully opened, before they have assumed a false position of banner or wings. The following are my notes on living flowers, with descriptions of some new species, following the order of Watson in King's Rep. in a general way:—

ASTRAGALUS DIPHYSUS Gray. Banner broadest at base, sides slightly reflexed at the top, not at all at base; white spot broadly cuneate and very slightly notched at top. It comes within a line of the tip of the banner. The banner is ascending less than 30°, sulcus V shaped. The calyx is cleft on the upper side, acute at base, and the lobes are unequal, the lower the longer.

ASTRAGALUS DIPHYSUS Gray var. LATUS. Like the type but the leaflets 3 to 5 lines long, 6 to 8 pairs, ovate or obovate to oval, obtuse to emarginate; calyx teeth shorter and broader, 1 line long, the tube 3 lines long; pod oval, straight, abruptly acute, completely 2 celled, rather deeply sulcate both dorsally and ventrally. Whole plant glabrous even to the pods, subdecumbent; lower stems enduring from year to year, many stemmed from a deep, thick, woody root, stems spreading more or less underground. The flowers are purple from a light-colored base, 6 lines long, and the cross section of the pod is nearly two circles, joined at the side. Schell Creek Range, Nevada, May, on the hillsides.

ASTRAGALUS BECKWITHII Torrey. Flowers cream white, never purple; banner almost erect, deeply notched, sides not at all reflexed, except at a point opposite the tip of the keel, where it is turned back for a space of 2 lines long, and at a point near the tip, and so is fiddle shaped, water lined. The sulcus in the upper part is broadly V shaped, but in the lower part of the banner it is almost circular, making the base of the erect part of the banner very convex on the outside, and narrowed at its insertion into the enlarged club-shaped lower part, and this narrows as it enters the calyx; banner 4 lines wide and 6 lines long above the calyx; wings obliquely oblanceolate, narrowed at the tip and nearly acute, 2 lines wide, nearly straight, 3 lines longer than the keel; keel long and narrow, slightly incurved, faintly purple veined at tip; leaflets generally emarginate;

pods without mucilaginous matter. This is quite common from the Wasatch Mountains to the western side of the Fish Spring Mountains, in Western Utah. West of there it is replaced by the next. It grows on gravelly hillsides. Pods purple spotted, thin and acute at each end.

ASTRAGALUS BECKWITHII Torrey var. PURPUREUS. This plant, though it has all the marks of a good species, I do not feel like describing as such till one or two things can be settled about it. Banner purple, fiddle shaped, nòtched at top and broad at base, arched to nearly 90° and abruptly, white spot fan shaped and streaked deeply (to the base on the sides) with purple; sulcus ¼ circle except at the base, where it is semicircular, fusiform longitudinally; the purple streaks on the white spot are united at the base of the sulcus into a purple ring; the banner is bent at a point 2 lines beyond the calyx teeth; wings obliquely ovate, rounded and obtuse at the apex, white from the tip to the keel and purplish beyond, upwardly curved, 2 lines wide, 2 lines longer than keel; keel purple and very dark at tip, incurved 100° to base, blunt. Whole flower curved upwards, purple and never yellowish except when old. The other characters are leaflets 6 to 12 pairs, inclined to be diamond shaped, 6 lines or less long and over ½ as wide, rounded, truncate or retuse; stems ascending, angled as well as petioles and peduncles; flowers 6 to 10, at first in a head but lengthening to 1 to 2 inches; penduncles shorter than the leaves; calyx as in the type, yellowish but with nigrescent hairs, tube 2 lines by 1½; teeth 1 line more, subulate from a broad base, almost black; calyx spreading in flower and reflexed in fruit, but the stipe (equaling the teeth) bent upwards so that the pod is nearly vertical; pod acuminate at each end, inwardly curved ventrally, so as to make ⅓ to ½ the arc of a circle, 1½ to 1 inch long, dorsal sulcus intruded ½ line, sulcate dorsally always at base, but not in the upper half when pod is much curved; when nearly straight and only acute at base and apex (which occasionally occurs) the pod is deeply sulcate, finely corrugated, cartilaginous, filled with a mucilaginous pulp when immature; seeds flattish, nearly round, with a prominent hilum, 1 line wide. Fully mature pods are usually obcompressed so as to be flat, while at the ventral suture they are compressed, making the cross section T shaped, usually purple spotted. This differs from

the type in the purple flowers, keel ½ broader, longer pod, which is cartilaginous and so thicker, pulpy pod, while the type has a thin and almost transparent pod, without pulp when young. If this latter point holds good in all cases, it is a good species. It is at once distinguishable from the type everywhere, and never has been found east of the Deep Creek Mountains in the western edge of Utah.

ASTRAGALUS CANADENSIS L. and A. MORTONI Nutt. have the following characters in common: Flowers in dense spikes, horizontal; calyx white, flattened, somewhat gibbous, hairy, tips broadly triangular and tufted with hairs, short; banner arched in a wide arc, sides reflexed, at tip the most, very little elsewhere; sulcus triangular and acute at tip of banner, rounded at base of banner; banner equaling the keel, ochroleucous; wings ascending and narrow, exposing both the tip and base of keel, obtuse, a line longer than keel.

ASTRAGALUS CANADENSIS has calyx decidedly notched on the upper side; bracts subulate, short; wings linear but slightly wider at blunt tip; keel little incurved; leaves in about 13 pairs and inclined to be lanceolate; spikes not denser fruited than in the other species. The keels of both species are veined.

ASTRAGALUS MORTONI Nutt. Calyx teeth not unequal; wings oblong-lanceolate, 1½ lines wide at base; keel purple tipped, arched to ⅓ of a circle; bracts ovate to lanceolate, 1 to 2 lines long; leaves inclined to be oblong and much smaller than in *Canadensis;* flowers in a closer and shorter head. Pods pubescent and densely aggregated, ascending as in the other species.

A. Canadensis was just coming into bloom at Grinnell, Iowa, on August 16, 1892, at 1,000 feet altitude, while *A. Mortoni* was well in bloom at Muncy, Eastern Nevada, on July 6, 1891, at 6,000 feet altitude.

ASTRAGALUS DODGIANUS, n. sp. Many stemmed from a woody root; stems very slender, flexuous, branching from the base, 6 to 24 inches long; stipules sheathing at the base, membranous and barely pointed, upper ones connate at base and very broadly triangular; whole plant except the glabrous pods minutely and sparsely pubescent; leaves 1 to 2 inches, with proper petiole ½ an inch; rachis leaf-like; leaflets 4 to 5 pairs, narrowly elliptical to linear, 2

to 4 lines long; peduncles 3 to 8 inches long, with racemose, scattered flowers on the upper half; flowers very small, erect to horizontal; calyx nigrescent, less than a line long; campanulate, triangular teeth a line long; calyx acute at base, on a pedicel ½ a line long, subtended by a triangular bract 1 line long; corolla arched; the very blunt, much incurved, and rounded, purple-tipped keel surpassing the calyx tips less than a line; wings oblong, entire, about a line longer than keel, ascending, flat to keel; banner abruptly bent at calyx tips to a right angle, 2 lines longer than keel, broad, deeply notched, white or light pink; pods ascending to pendulous, linear-oblong, dorsal suture straight, ventral slightly curved, minutely stipitate, flat and vetch-like, abruptly acute or apiculate, membranous, reticulated, with no trace of a dorsal intruding septum; seeds (6 to 10) broadly ovate to almost reniform. Were it not for the characters of the pod this might be referred to *A. Robbinsii*, var. *occidentalis*, Watson. May 7, 1891, at Thompson's Springs, Eastern Utah, on rocky slopes, rare. Named for Col. D. C. Dodge.

ASTRAGALUS IBAPENSIS, n. sp. Allied to *A. Robbinsii*, var. *occidentalis* apparently, but leaves seemingly quite different, and pod also. (?) The description of Watson's variety is very meager and gives almost no leaf or floral characters. This plant is very slender; stems ascending from a deep, erect and slender perennial root; leaflets 1 to 7, elliptical to linear, lower obtuse, the upper acute, all but the terminal ones 2 to 6 lines long, the terminal one twice as long as the others; upper leaves with one long, linear leaflet, acute at each end, 1 to 1½ inches long, 1 line wide, gradually tapering into the rachis or petiole, which is 6 lines long and not jointed to it, occasionally with a single falcate, very acute, linear leaflet at base; stipules ovate to broadly triangular and mostly connate, usually acute; very slender stems grooved; whole plant minutely strigose pubescent, even to the pods, which are more densely so and not black hairy; penduncles slender, racemosely arranged on stems, 1 to 2 inches long; flowers white, 1 to 3, at the top of peduncle; spreading pedicels a line long and with an ovate bract at base, apparent reflexed in fruit; calyx shortly campanulate, a line long and as broad; teeth triangular, ½ line long; corolla 3 lines longer than calyx and teeth; banner very broad, abruptly arched at tip of teeth

to a right angle, erect part 1½ lines long; keel surpassing calyx teeth 1½ lines, incurved with the end straight, blunt, purple tipped; wings barely equaling the keel; pod oblong-linear, very shortly stipitate, 6 lines long, 1½ lines wide, abruptly acute, both sutures prominent, flattened, apparently 1 celled, ventral suture arched, dorsal straight.

June 23, 1891, Deep Creek Mountains, Western Utah, at 5,500 feet altitude, among brush. The arching of the ventral suture of the above two species would suggest *A. Robbinsii*, as that feature is very rare in Western plants, but the racemosely arranged short peduncles and upper simple leaves are quite peculiar.

ASTRAGALUS BIGELOVII Gray. This in its flower is allied to the *A. eriocarpus* group along with *A. amphioxys*, and apparently should include the *A. Mathewsii* Watson if there are no other good characters than those given by Watson. Banner arched 80° in a gentle curve, sides reflexed from calyx to tip 100°, the folded part being 1½ lines wide at base and gradually reduced upwards so that the outline of the banner as one looks at it is oblong with straight sides and an enlargement at the base; sulcus a line deep and ¾ wide, broadly V shaped and continuous to the apex of banner, white spot occupying the whole of the sulcus and to within a line of the top of banner, narrowly oblong, emarginate, purple tinged below; base of banner, sides and tip rose purple, darker at the base; wings linear, ¾ line wide, with a little lobelet on upper side near the base, obtuse, ½ line longer than keel, ascending 30°, dark rose purple at base and the upper two lines white, nearly flat with the tips slightly incurved and so not quite vertical; keel dark purple-tipped, blunt and moderately incurved; banner rising 4 lines beyond the tip of keel, in all 5 lines longer than tip of calyx lobes; calyx pink, a little inflated, narrower with age and, white, somewhat flattened, gibbous, ascending 45°; bracts 3 lines long and green.

Taken from specimens gathered at Rincon, New Mexico, April 15, 1892. It is also abundant in Eastern Utah.

ASTRAGALUS GLAREOSUS Douglas. The plants which I have hitherto distributed as *A. glareosus* are *A. Chamæleuce* Gray, while this plant occurs sparingly throughout the Great Basin region of Utah, and is credited to Southern Idaho, and by Coulter to Wyoming also. I have hitherto considered it as *A. Chamæleuce* but it

is clearly not that plant, and differs from *glareosus* in having a 2-celled pod that is 1 celled at apex only, the flowers also are cream white, and not "blue," indistinctly purple veined. Pods long, 1 to 2 inches, acuminate, lanceolate, fleshy when green, much compressed, 2 celled by the intrusion of the dorsal sulcus, long-appressed hairy, often sulcate both dorsally and ventrally, dorsal sulcus very deep; banner extending 4 lines beyond the calyx teeth, slightly and gently arched, notched, sides reflexed at base only, 2 lines longer than the blunt, incurved and purple-tipped keel; sulcus deep, semi cylindric, wings linear, a little longer than the keel, horizontal at tip; calyx cylindrical, 5 lines long; teeth subulate, a line long or more, nigrescent peduncles 2 inches long, shorter than the leaves and prostrate in fruit except in the shade, leaflets narrowly lanceolate to narrowly oval, 3 to 5 lines long and 1 to 2 wide; whole plant coarsely silky pubescent with appressed hairs; stemless, not at all woolly. It grows under sagebrush in the valleys or lower hillsides and is quite distinct from any other species that I know. It flowers early in May.

ASTRAGALUS UTAHENSIS, T. & G. Though it is difficult to always separate this from *A. eriocarpus*, and less so from *A. Purshii* in the herbarium, yet it is not at all so in the field, since *A. eriocarpus* flowers at least a month earlier than *A. Utahensis* and is out of bloom before the other blooms. *A. Purshii* blooms as early or earlier than *A. eriocarpus* and is a high altitude plant, *i. e.*, does not grow in the valleys, the home of the other two species, though the latter sometimes go up to 7,000 feet altitude. In *A. Purshii* the pubescence of the leaves is quite different, while the matted habit and narrow leaves and short woolly pods distinguish it at all times. It would certainly be considered a hybrid from the other two if they grew together with it but they never do.

In *A. Utahensis* the banner is oval as one looks at it in the flower, rather deeply notched, white spot broadly cuneate, tridentate or with a single acuminate tooth from the center of the rounded or truncate apex, sides of white spot beautifully veined with narrow nearly parallel purple lines running down to the base; banner brilliant pink purple; wings linear, 2½ lines longer than keel, slightly enlarged at tip, rounded or almost truncate, straight, purple throughout; tip of keel dark purple. This is one of the handsomest flowers in the West, but though very common in Central Utah seems to become less so westward.

ASTRAGALUS ERIOCARPUS Watson. Flowers brilliant pink purple, and closely resembling those of the above, but sides of banner not at all reflexed, either notched ½ a line deep or not at all, ascending 45° or less; white spot almost obliterated by rather broad, palmate, purple veins, which are united into a solid purple spot at base; sulcus in banner semi-cylindric; wings a line longer than keel. Deep purple tipped, obtuse, scarcely broadened at base, a little narrowed at apex; keel dark purple, scarcely incurved, very blunt; flowers nearly as large as in *Utahensis*, but fewer. It is abundant in the valleys, but not in alkaline soil.

ASTRAGALUS AMPHIOXYS Gray. This plant has no characters that I do not find in *A. Shortianus*, except the pubescence of the calyx, which in the former is appressed and silky or strigose, and in the latter is spreading and loose. The shape of the pods, that both Gray and Watson had to abandon in regard to *A. cyaneus*, is equally valueless in the new species created. There may be a character in the flowers to keep up the species, as well as the pubescence. I have not studied *A. Shortianus* in flower as I have the present species. I have never seen any true *A. Shortianus* in Utah or Western Colorado, all the plants belonging to *A amphioxys*, which is very common. The usual form has the banner of the flower ascending remotely from the calyx, which gives the flower a slender, long look, but there are forms with a short corolla. There are also three forms of pod. One is the typical pod, as described by Gray, not fleshy to any extent. Another has a shorter pod, which is less acute at apex, often small, and rather blunt at base. The other has a very fleshy pod, which, on drying, becomes wrinkled with prominent sutures and intermediate in form. While all these forms run together, and have no floral character that is constant, so far as I have seen, they all, without exception, have the appressed pubescence of calyx. The floral peculiarities are brilliant pink purple flowers; banner with sides reflexed 10° to 60°, or even more. When little reflexed the outline is oval, when much it is oblong or tapering upward, ascending; sulcus 3 lines broad and very shallow, only concave, 4 lines long, white spot truncate and often deeply notched, oblong or broadly cuneate, ragged on the upper end, with little purple veinlets, stippled with fine purple spots; banner darkest near the white spot, lighter on the edge; wings linear to oblong lanceo-

late, rounded, obtuse, oblique, ascending, concave to keel, nearly horizontal and connivent over the keel, forming an arch over it, 2 lines wide and ½ a line longer than keel, purple; keel all purple. One form has banner 5 lines long, short; calyx 3 lines long, and teeth 1½ lines long; pods hoary, and whole plant densely silky. Another form has fleshy pods, less hairy; calyx 4 lines and teeth 1 line long; keel rounded, ½ narrower than the above; flowers 8 lines long. This plant is instantly recognized by the arched and connivent wings and stippled white spot.

ASTRAGALUS CHAMÆLEUCE Gray. (Distributed by me as *A. glareosus*, but not in my sets.) Flowers 1 inch long, pink purple, few; banner in flower oblong-oval, sides reflexed 45°, plain, dark pink-purple with darker veins, tip with a central notch ¾ line deep, and with two shallow ones adjoining, seldom absent; white spot comes within a line of the edge all around and as low as the keel, narrower below, obovate-cordate, edge ragged, with red-purple veins; below and a line apart are two patches of anastomosing red-purple veins; wings narrowly oblong, dark purple at tip, oblique, rounded, tip twisted just below tip of keel, and horizontal; keel narrow 2 lines below tip, blunt and rounded, dark purple at tip; pod very fleshy, cartilaginous, and sparsely short hairy. It always grows in firm, damp meadows, in mountain parks, or high valleys. It blooms in June and July. It is a matted, woody-rooted, prostrate, densely branched, silvery plant, with short peduncles among the leaves.

ASTRAGALUS IODANTHUS Watson. This is the most variable plant of the genus in Utah, and may include several species recently erected. The sides of the banner are reflexed, so that the outline is oblong, notched; white spot, deep purple veined; banner deep purple below, and shading to white at tip, or purple throughout, slightly sulcate, ascending 30°, sides most reflexed at base; wings long, dark purple at base, and white from tip of keel to apex, 3 lines longer than keel, rounded, obscurely erose or notched, ascending near the tip. The pod is fleshy, black hairy or nearly glabrous, plain or spotted, straight or arched into a semicircle, round or obcompressed, sulcate or not. It grows everywhere except on alkaline flats in the valleys, but does not go beyond the higher foothills of the mountains.

ASTRAGALUS PEABODIANUS n. sp. Inflati. Perennial, matted cæspitose from a branching root; stems 3 to 6 inches long, densely branched and prostrate, very leafy, root not woody; leaves 1 to 2 inches long, including the ½-inch petiole; leaflets 4 to 8 pairs, 3 to 4 lines long, 1 to 1½ wide, oblanceolate to narrowly oval, rounded at apex and acute at base, edges contiguous, softly pilose with spreading hairs, as well as all the rest of the plant, even to calyx and legume, but the latter rather densely long pilose; peduncles an inch long, 3 to 6 flowered, and loosely so; flowers ascending, in fruit horizontal, pedicel very short; calyx campanulate, a line long, teeth the same and setaceous; banner abruptly reflexed at tip of calyx teeth, broad, notched, white or purple, 3 lines long, erect part 2 lines long; purple tipped keel surpassing calyx teeth by 1½ lines, arched, the acute tip incurved to nearly a semicircle; wings barely surpassing keel, lanceolate, entire, obtuse; pods 6 lines long, membranous, ovate or lanceolate, acute, sessile, when ripe incurved to nearly a semicircle, cross section triangular and acute at ventral suture, with rounded lobes at base, dorsal septum not intruded, but dorsal sulcus always so at base of pod and to the middle; 1 celled, no intrusion of ventral suture, but the suture is rather thick; while the dorsal is inconspicuous.

Resembles *A. Parryi* in habit, and is allied to *A. triflorus* and *A. triquetrus*, but quite different; clay soil, at 5,000 feet altitude, Thompson's Springs, Eastern Utah, May 7, 1891. Dedicated to George Foster Peabody.

ASTRAGALUS GEYERI Gray. Banner oval to ovate, but sides generally turned back at some angle less than 90°, then the outline is oblong, slightly notched, white or very light purple. faintly purple veined; white spot scarcely visible, coming within ½ a line of the sides and end; banner ascending to 75°; sulcus shallow, scarcely contracted at base; banner 1½ lines longer than wings, and wings 1 to 1½ lines longer than keel; blade of wings obliquely ovate, obtuse, ascending 30°, 1 line wide; keel a line longer than calyx teeth, incurved 100°. I have doubts that it is annual, for the slender roots seem to have tubers on them. Very common in gravelly or light soil in the valleys and lower slopes. It blooms May to June.

ASTRAGALUS PLATYTROPIS Gray. This interesting subalpine plant is found only on the high mountains, occurring as far east as the

Schell Creek Mountains only. It may, however, exist on the Deep Creek Mountains. It is one of the earliest bloomers, close to snow. It is inclined to spread from the roots, but never forms mats. It is rare. Banner white or dirty, tinged with yellow, varying to light lead colored, bent abruptly to 45°, from mouth of calyx, concave, and so the sulcus is very widely V shaped, hooded at apex by the narrowing of the sulcus, 3 lines long, notched, and often with accessory notches, about as broad as long but a little wider at base than apex, sides not reflexed or but little, slightly purple veined opposite mouth of calyx; wings arcuate upwards and exposing the whole keel, obliquely lanceolate oblong, or nearly so, obtuse tip bent outward forming with the keel the letter T, just equaling the keel; keel abruptly bent 90°, purple, dark at tip, point rounded, equaling the banner; pod dark and dark purple mottled, ovate, ¾ by ½ inch, abruptly pointed, straight, papery, and much inflated, oblong oval, cross section oval contrary to the partition and emarginate on each side, prostrate when ripe. Scapes erect to decumbent. July.

ASTRAGALUS TOANUS n. sp. Allied to *A. nudus*. Lower leaflets 3 to 6 pairs, upper ones reduced to the long and cylindrical rachis; pods 2 to 4 on the ends of rather long peduncles; erect, ¾ to an inch long, 3 lines wide, compressed, erect, straight or curved, acute, thick and corrugated, both sutures prominent; sessile, lanceolate oblong, with very acute edges, cross section elliptical, seeds 1½ by 1 lines, calyx teeth minute, triangular; calyx 3 lines long. This grows in clumps like the others of the section. It is nearly glabrous throughout, erect, 2 feet high. It was out of flower July 21, 1891.

Found on the slopes of the Toano Range, Eastern Nevada, in open ground. It can neither be referred to *A. nudus*, *A. pectinatus*, or *A. Grayi*, but is intermediate between *A. nudus* and *A. pectinatus*. It may be that all four are forms of one polymorphous species, but I do not know of connecting forms.

ASTRAGALUS ARTIPES Gray. This plant is so like *A. Beckwithii* (except possibly the fiddle-shaped corolla) that it will be passed over generally when not in fruit; however, the calyx teeth about equal the tube, and are thread-like at tip; pod 1½ by ¾ inches, spotted, straight, tip slightly curved and almost blunt, base truncate; stipe equaling the calyx teeth; no apparent dorsal suture, ventral not prominent nor inflexed; pod probably round in cross section but

somewhat flattened or sulcate ventrally, 1 celled; seeds not round; calyx erect in fruit; pods erect or spreading. It is 1 to 2 feet high, slender. It was collected in gravelly soil at about 5,000 feet altitude in Utah Valley, May 16, 1891. The leaflets are broadly lanceolate to oval, obtuse to emarginate, 3 to 6 lines long, 10 to 14 pairs. Hitherto this has been supposed to be a southern species, but it has doubtless been overlooked.

ASTRAGALUS CALYCOSUS Torrey. This most interesting and badly named little species proves to be very common in all the ranges and hills west of the Wasatch Mountains, Utah. I have gathered it as far west as Humboldt, Nevada. Watson's description in King's Rep. is faulty also. Outline of banner oval, cleft a line deep, sides reflexed 100°, generally cream white but often purple; white spot broad, with cuneate sides to the middle where it widens again, broadly emarginate at apex; sulcus rectangular and broader than deep; wings very closely appressed to keel its full length, red purple to tip of keel, white beyond, deeply cleft, lower lobe 1 to 2 lines long and like a normal wing, the upper lobe is 1/3 wider, bent upward and inward till it touches the banner, both lobes narrowed and rounded at tip, usually from the cleft in the wings a long thread like lobe arises and is nearly as long as the lobes; keel enlarged just above the calyx so as to make a hollow in the banner, with a decided hump near the base of keel; calyx notched deeper on the upper side; pod always arched when well developed, acute, 4 to 12 lines long, 2 celled, cross section ovate with a cordate base. Flowers erect or prostrate, pods narrowly oblong to linear, usually prostrate. It is not subalpine, as given by Watson; it is rare above 7,000 feet altitude and abounds in the valleys in gravelly soil, 5,000 to 7,000 feet altitude. Torrey's and Watson's specimens seem to have been starved and with a poorly developed pod.

ASTRAGALUS ATRATUS Watson var. STENOPHYLLUS n. var. Flowers smaller, leaves narrowly linear, short, minute, or wanting, and only the rachis present, always so in the upper leaves.

This is No. 3840 of my sets of 1882. Collected June 14, 1882, at Palisade, Nevada, distributed as "Astragalus n. sp."

ASTRAGALUS FILIPES Torrey. I believe there is an earlier name for this, but the old name will be the more familiar, and equally as good for my purpose. Banner light cream colored, arched at right angle.

oblong, 4 lines longer than keel, expanded at base like *A. Beckwithii*, sides reflexed 20° or less, groove very shallow and acute, scarcely narrower at base, not enlarged or narrowed on the outside toward the base; banner acutely notched at apex, ¾ line deep; wings obliquely obovate or lanceolate, ascending 45° so as to expose the bottom of keel, concave to keel, entire or obscurely toothed at rounded apex; keel incurved 100° or more, blunt, tipped with yellow. Schell Creek Mountains, Nevada, July, 1891.

ASTRAGALUS KENTROPHYTA Gray. It is hard to believe that a subalpine plant in the Wasatch can be the same as one growing on the driest slopes of valleys in the arid regions, but so far I can see no distinguishing characters. The floral characters of the arid plant are these: calyx bent like Hedeoma; banner arched less than 90° abruptly and with a hump below the bend also, cucullate, sides very concave and little reflexed; sulcus very shallow; banner contracted about a line below the tip, so that the general outline is oblong, tip abruptly reflexed or not at all, deeply notched, a little broader at tip than below, finely striate veined with purple; wings connivent, oblong-ovate, obtuse or barely acute, 1½ lines longer than keel, ascending; keel purple tipped, sharp, and much incurved. Very dry knolls in valleys of Eastern Nevada, fruit in July.

In my last "Notes" in ZOE I inadvertently transposed the terms dorsal and ventral in describing my species of *Astragalus*.

CERCOCARPUS LEDIFOLIUS Nutt. In a former communication in ZOE I gave some general details of the relation of the type to the variety *intricatus* Jones. Having now examined minutely all my material from all sources and also that in the Shaw Botanic Gardens (the Engelmann collection), my conclusions are that there is but one good variety of *C. ledifolius* and that one is the var. *intricatus*, which does not deserve higher rank. *C. parvifolius* Nutt. var. *breviflorus* Jones. I reduce from the *C. breviflorus* Gray, Pl. Wright 2 p. 54. It is clearly a form of the more robust species. *C. fothergilloides* HBK. is quite variable, and some forms are hard to separate from *C. parvifolius*. I studied this latter carefully in the Sierra Mojada in May, 1892 (Mexico).

The following are some notes on *C. ledifolius* and its variety. The species sheds its leaves late in the second season.

July 2, Muncy, Nev. Leaves lanceolate to linear, margins revolute, nearly glabrous, bark dark gray.

November 19, Tintic, Utah. 7,000 feet altitude, leaves old, lanceolate, short woolly on both sides, typical form.

June 12, 1891, Dutch Mountain, Utah. Typical form; leaves broadly lanceolate, not revolute, large, glabrous on both sides, or nearly so below, petiole 2 to 3 lines long, calyx white woolly and tips with a tuft of wool.

July 8, 1891, Ruby Hill, Eastern Nevada, 8,500 feet altitude. Leaves lanceolate, glabrous on both sides, slightly revolute, calyx and tips pubescent only with very short wool.

June 20, 1892, Mt. Ibapah. Leaves broadly lanceolate, slightly pubescent, not white beneath, varnished, slightly revolute.

June 23, 1892, Mt. Ibapah, Western Utah. Leaves oblanceolate to lance-oblong, glabrous on both sides, calyx pubescent.

June 23, 1892, Spring Creek, Eastern Nevada, altitude about 7,000 feet. Leaves, older ones, linear lanceolate, 3 lines wide, scarcely revolute, upper surface nearly glabrous, lower white with very short and dense wool; other leaves on the same plant linear and revolute; anthers nearly orbicular and emarginate above and below.

Specimens No. 2, same locality. Leaves not revolute, lanceolate, an inch long, very woolly on both sides.

August 30, 1891, Moab, Southeastern Utah. Leaves glabrous and varnished, linear and cylindric, 3 to 8 lines long, ½ to 1 line wide; young branches short woolly. This is like Watson's type of *intricatus*, but with smaller leaves approaching the extreme form, with varnished minute leaves, collected by Coville in Southwestern Nevada.

June 9, 1891, Furber, Eastern Nevada. Tails of fruit 3 inches long, short plumose to within ½ inch of the tip, where they are bare; leaves linear-oblong, revolute or not revolute, very woolly or hairy on both sides. The length of the tails is determined by the weather. If it is dry they are very short and abortive; if wet, they are long.

May 20, 1891, Desert Mountains, Utah. Leaves 3 to 6 lines long, ½ to 1 line wide, varnished, cylindrical, densely fascicled.

May 16, 1891, Homansville, Utah. Leaves linear to lance-linear, glabrous or short villous, old leaves less revolute; flowers pubescent, plants less densely branched.

July 2, 1891, Muncy, Nevada. Broadest leaves 3 lines wide and 6 to 12 long, glabrous; narrowest, on the same plant, a line wide; bark darker than usual.

June 19, 1891, Clifton, Western Utah. Leaves 6 lines long, 1

line wide, linear, older ones glabrous and varnished, edges revolute nearly to midrib, and so nearly cylindrical, very abruptly acute; petiole ½ line long; leaves fascicled at the ends of branchlets; intricately branched; bark white throughout, or nearly so. Others from the same place have the leaves 4 lines long, narrowly elliptical, nearly glabrous, and the under surface not chalky white, as is usual in the type.

June 9, 1891, Furber, Eastern Nevada. Branchlets more slender; leaves less crowded, 2 to 6 lines long, younger ones white silky villous, and both sides alike, narrowly oblong, blunt, some scarcely revolute; tails an inch long, the upper half bare, plumose part with hairs 2 lines long and densely white, the hairs gradually growing shorter to the beardless tip. This latter is the case in all forms; calyx 3 lines long.

Specimens No. 2. Leaves very short-woolly, chalky white below, some scarcely revolute; calyx 4 lines long; otherwise as the above.

Specimens No. 3. Leaves densely white woolly, oblong linear, 3 to 4 lines long, 1 to 2 wide, broadest not revolute.

There are many other forms, but those given show the general trend. The variety is usually a densely and intricately branched shrub, 3 to 5 feet high, with light gray bark, abounding in rocky ravines and cliffs and rocky hillsides, forming a large part of the brush of the low mountains. It abounds below 7,000 feet altitude, but rarely grows much higher. The type begins at about 7,000 feet altitude, and runs up to subalpine on the higher mountains. On Ruby Hill, at 9,000 feet altitude, I saw the type matted like the firs near timber line on the loftiest mountains. Both the type and the variety are very much affected by the soil and moisture where they grow. The variety seems to be a form of the type that has adapted itself to conditions that the type, from its larger surface of leaves, cannot do. It is strange that Watson never saw this plant in Nevada, where he spent a season, and where it is very common. It was doubtless an oversight, as he also reported that he did not see *Juniperus Californicus* var. *Utahensis* (as it is now called) in Utah, while it is the only tree on Antelope Island, and the island is black with it, and was when he was there camping. It is also found everywhere in Utah.

RIBES CEREUM Dougl. The flowers have a cannon-shaped calyx; petals white, rounded at tip; calyx tips reflexed; fruit yellowish red

and woolly, as well as glutinous. It is occasional in Western Utah and Eastern Nevada.

ŒNOTHERA JOHNSONI Parry Am. Nat. 9, p. 270. This very poorly described plant is said to have elongated stigmas, petals an inch long, calyx tube not shorter than the leaves, capsules 9 to 12 lines long, somewhat 4-angled, strongly nerved, not crested, and to resemble *Œ. primiveris*, and to be very common at St. George, Southern Utah. The species which I have collected abundantly in Western Utah and Eastern Nevada is perennial, cæspitose from a many-branched root, which is covered at the summit with the dead petioles of former leaves, acaulescent or stems an inch or two long; leaves lanceolate, gradually decurrent into the petiole, which is 1 to 3 inches long, and never more than ½ the length of the blade; blade entire or undulate, or irregularly and sparsely dentate with sharp teeth; whole plant hoary with a dense, soft, and very short pubescence; calyx tips free in the bud; calyx splitting on one side and reflexed in flower, lobes 1 to 1½ inches long, tube 3 to 5 inches long and erect, with 8 striæ; petals rhomboidal, entire or slightly lacerate on the edge; 2 to 3 inches wide, and 2 to 2½ long, golden yellow, palmately veined with 3 very prominent and several intermediate veins, each feather veined in addition; the petals, in drying and fading, turn red, and resemble the meshes in the web of a frog's foot; stamens ½ line wide and 6 lines long, versatile, yellow; stigma lobes 4 to 6 lines long, ¼ line wide; capsule ovate, broadly winged, not nerved or veined, less than an inch long, not crested, hoary white; calyx also with scattered, fine, long, white hairs.

This grows on sunny southern slopes in very dry places, blossoms in June, and is by far the handsomest species of the genus. It is vespertine. Rather common in Western Utah and Eastern Nevada at 6,000 feet altitude. Should it prove to be new, I name it *Œnothera Howardi*, after Mr. A. M. Howard, the gentleman in my party who saw it first.

ECHINOCACTUS PAPYRACANTHUS Eng. The flowers are an inch long, opening but little; stigma cleft a line deep into 6 anther-like divisions, papillose on the sides and upper surface; filaments 6 lines long; style almost as long as the petals, ½ a line thick, linear; the flowers open in the morning, and close in the afternoon, but apparently are not affected by cloudy weather. This grows in alkaline soil, and blooms in May. It is scarce everywhere.

ECHINOCACTUS SIMPSONI Eng. Should be called *Mamillaria Simpsoni*, as all its relatives are there, and it differs in but one respect from that genus, *i. e.*, having the flowers just a little above the base of the tubercle. It blooms in daylight, and closes partly at night. Rather common at high altitudes, *i. e.*, above 7,000 feet. La Sal Mountains, Eastern Utah, and through the Territory and into Nevada. June.

ECHINOCACTUS WHIPPLEI Eng. This opens in the forenoon, and closes partly between 5 and 6 P. M. It also opens in the daytime if put in a dark place. It blooms in June, inhabiting the alkaline valleys and gravelly slopes. Occasional in Western Utah and Eastern Nevada.

OPUNTIA RUTILA Nutt. This is not distinct from *O. Missouriensis*. The flowers close partly at night, and in rain probably. Common. It blooms in May and June.

CYMOPTERUS CORRUGATUS Jones. This is not the type, but is the plant referred by Watson to *C. Fendleri*, and by Coulter and Rose to *corrugatus*. I could not get it with mature fruit. Involucre none; involucels broadly oval and scarious, or lanceolate and green, acute; fruit broadly winged; flowers white. Clayey hillsides near the Sevier River, Utah, below Juab. June, 1880. I doubt that it belongs to either species.

CYMOTERUS IBAPENSIS n. sp. Flowers white, in a head an inch wide; root large and long, thick and fleshy, erect, usually branched at summit, leafless but densely covered with what appear to be old leaf petioles; from amid these the scape arises and is 2 inches long in flower, its summit bears a tuft of many leaves; scapes in fruit 6 inches long or less; peduncles in flower shorter than the leaves, lengthening in fruit to 4 inches; leafless, striate, erect in flower and erect or decumbent in fruit; leaves fleshy and on drying finely wrinkled and so appearing to be finely pubescent, but glabrous, 3 inches long, ternate with the divisions pinnate to bipinnate, ultimate segments obtuse, either obovate and less than a line long or linear-spatulate and 2 lines long; base of petioles of the outer leaves much enlarged, nerved and sheathing, the rest less so; petioles not over an inch long, nerved; umbel of 6 to 8 rays, scarcely perceptible in flower, 1/2 inch long in fruit and stout; involucre none; involucels

of a few linear, acute, fleshy, not scarious scales, 2 to 3 lines long, distinct to the base; pedicels in fruit 2 lines long, filiform; flowers 5 to 8 from each ray; fruit 2 to 2½ lines long, broadly oblong truncate at each end, face concave only, about 1/3 of a circle, less than a line wide; oil tubes 3 between the ribs and 6 on the commissure; lateral wings a line wide, dorsal 1/3 less, all thick and corky for the size of the fruit. It is a close congener of *C. longipes* but differs in the size and division of the leaves, white flowers, small and simply concave fruit, and habitat. It is found only on clayey alkaline soil in the centers of the valleys. The fruit face is that of *C. montanus*. Deep Creek Valley, 5,000 feet altitude, June, 1891. A feature of the flowers that is more or less common to all the genus is in the petals, which are triangular lanceolate from a broad base, thick, deeply sulcate, barely acute, with incurved apex, so that the tip touches the disk between the contiguous edges of the petals; anthers black purple, reniform cordate, lying on the recurved filament next the edges of the petals like seeds in a five-celled pod, just bursting forth; they are very pretty; the filament straightens and thrusts the anther ½ a line beyond the petal; it then bursts; style not exserted at first.

CYMOPTERUS LONGIPES Watson. This plant is acaulescent at first and the yellow flowers are sessile in a rosette of green leaves, then the flower stalk lengthens always, is erect, and, after blooming, droops till the fruit is pendent, then as the fruit ripens the stem (peduncle) usually becomes erect again. The scape usually lengthens also, but not always. Abundant in the Wasatch and less common westward.

OROGENIA LINEARIFOLIA Watson. The Indians are fond of the raw bulbs. The flowers are white and the peduncles decumbent. This is one of the very earliest bloomers, and, though common, is seldom seen, as the plant is hardly visible when in fruit and even that disappears in a few weeks with the leaves.

TOWNSENDIA SCAPIGERA Eaton. The flowers open between 9 and 10 in the morning and close between 5 and 6 in the afternoon. It is frequent.

I think that Gray has confounded two well-marked species of *Bigelovia* in his cosmopolitan *B. graveolens*. One has a thyrsiform inflorescence, cylindric campanulate corolla with reflexed or widely

spreading lobes a line long, and usually glabrous stems and leaves; it grows 1 to 3 feet high. This is the *B. graveolens* Gray, really (Nutt). The other species is what should be called *B. nauseosa* (Pursh) and is the *Linosyris albicaulis* T. & G. This is also *B. graveolens* var. *albicaulis* Gray, and will include as varieties of it var. *latisquama* (Gray) and var. *hololeuca* (Gray). The type has a fusiform corolla, lobes almost never spreading and never reflexed, usually closed, often short; corymbiform inflorescence, usually flat topped with many heads, occasionally corymbs with few heads and somewhat thyrsiform in outline; stems white tomentose. The corolla is generally with closed lobes and then the fusiform character is very evident; it is always a little contracted at throat. The "cobwebby hairs" are found on all forms of the *B. graveolens* of Gray and are of no value.

Biglovia albida Jones. This name was not one of my choosing, but was insisted upon by Dr. Gray, who would not believe that I was correct in saying that the flowers were white. I have again had an opportunity to study this plant growing and find that the flowers are pearly white, the dirty white color of the dried specimens is due to the viscid matter of the heads coloring the flowers. The plant is 1½ to 2½ feet high, grows in clumps like the others, but more open; it is densely fastigiately branched at the top. It is found only on alkaline soil in the valleys and grows alongside of *Sarcobatus vermiculatis*. It is locally abundant on the eastern side of the Deep Creek Mountains, also in Spring, Antelope, and Steptoe Valleys, in Western Utah and Eastern Nevada.

Helianthella argophylla (Eaton) Gray. This botanical nomad, which has been successively called *Tithonia argophylla*, *Encelia argophylla*, *Encelia nudicaulis*, *Helianthella nudicaulis*, and now rests under the above name as the proper one, is cæspitose from a deep woody root, 1 to 1½ feet high (the peduncles); hoary with a dense, soft, and very short pubescence; old leaves silvery white, from nearly reniform to ovate, always with a cuneate base, and with a very long and margined petiole, 3 nerved, cauline none, or a rudiment, or occasionally there is a normal leaf at the base of the peduncle, blade 2 inches wide (usually), and an inch long, obtuse and entire; leaves very many and crowded at the root; petioles 5 inches or less long; bracts lanceolate acuminate from a broad base, either

like the leaves or softly tomentose in pubescence, in several series, not recurved, widely spreading in fruit because of the expanded head, which is hemispherical in fruit, not surpassing the disk flowers, obtuse; heads an inch broad and ½ an inch high, nodding in fruit usually; flowers nearly golden yellow; rays about 20, 2 inches long, and ½ inch wide or smaller, narrowly elliptical, minutely 5 toothed at the apex, neutral, usually with two loblets, one near the base of the ligule, and the other near the base of the blade; these lobelets are 3 to 8 lines long, and either green or yellowish; disk flowers urceolate-cylindric, 3 lines long, a line wide; proper tube a line long, very narrow, glandular; lobes reflexed, short, and hispid at tip; style tips bluntly triangular; ovaries nearly linear and slightly widened at tip, white silky with chaff-like hairs; margin hyaline and very hairy; apex with two scale-like awns equaling the short tube; ovaries 4 lines long exclusive of the awn, and flat; mature akenes obovate cuneate, and truncate to narrowly cuneate, black, with white callus margin, which is long villous; body of akene parsely hairy; pappus awns present or absent; crown entire or lacerate, ½ a line high or almost wanting. The leaves are thick and the whole plant so nearly simulates *Balsamorhiza sagittata* that I have no doubt it is quite common where that plant has been supposed to be abundant. It is sometimes found growing near it also. It abounds in Western Utah and Eastern Nevada on sunny and dry hillsides, on the southern slopes, in bare places, from 6,000 feet altitude down. It is abundant at Detroit, Dugway, and Gold Hill, Western Utah, and at Furber, Glencoe, etc., in Eastern Nevada, and doubtless abounds throughout Nevada and Southern Utah. My large and varied material and my field studies make it certain that the two species *argophylla* and *nudicaulis* are identical, and the older name must prevail.

BALSAMORHIZA SAGITTATA Hooker. The horses seem to like the leaves, as I noticed my animals eating it with evident relish. It is frequent throughout the Great Basin region.

TETRADYMIA GLABRATA Gray. The spines of all the species arise from the bark. In this, the "spineless" species, they are present and formed like the other spiny species, but they are so weak and narrow the same year they are formed that they are called spine-tipped leaves, and as they fall at the end of the season they are not dignified with the name of spines. In *T. Nuttallii* T. & G. the spines persist till the second year and then fall.

ARTEMESIA TRIDENTATA Pursh. This is considered a sure remedy for pneumonia, being taken internally, and also a poultice made of it and applied to the chest. One of my men was taken violently sick with mountain fever, his temperature going up to 104° and remaining there; when other remedies failed, I gave him a large quantity of the cold infusion of the leaves, which cured him in a few days.

MALACOTHRIX TORREYI Gray. The flowers close at night.

CREPIS OCCIDENTALIS Nutt. The flowers close at night.

LYGODESMIA SPINOSA Gray. This plant it seems to me has been wrongly referred to this genus; it is a better *Stephanomeria;* in habit it closely resembles the perennial species and also *Chætadelphia*, which is hardly distinct. In some specimens recently sent me from Idaho by Mrs. Brodhead I found the upper $\frac{1}{3}$ of the pappus was long plumose like *Stephanomeria* in many cases, while the rest of the pappus was strongly barbellate. The pappus is stout at base and differs from *Stephanomeria* in being multisetose only.

PRIMULA BRODHEADÆ n. sp. 2 to 4 inches high; 1 to 4 flowered; scape 2 to 4 inches long; leaves 1 to 4 inches long, narrowly elliptical, rounded at apex, glabrous, rather thick, smooth, entire, narrowed at base to a winged petiole an inch or less long; flowers purple, about 5 lines wide, lobes orbicular or nearly so, notched, with a very short claw 2 lines long, tube exceeding the calyx by 2 lines: funnel form above the calyx; calyx lobes $1\frac{1}{2}$ lines long and subulate lanceolate, barely acute, equaling the tube of the calyx; pod nearly spherical; pedicels of lateral flowers about a line long, the terminal one 2 to 6 lines long; bracts oblong to ovate lanceolate, entire or toothed at apex, 1 to 6 lines long; base of plant covered with the dead sheaths of former leaves; roots like those of *P. Parryi*. Marshy places at Ketchum, Idaho, May to early June, altitude 6,000 feet. The perfume at first is rather strong and sweet. Dedicated to Mrs. Brodhead, the collector.

Var. MINOR n. var. Leaves an inch long or less, elliptical oblanceolate and acute, thin; lobes of the corolla as large as the type, but obovate; lobes of the calyx longer than the tube; flowers 1 to 2 on the scape; bracts long; plant 2 inches high. Bayhorse, Idaho, July 1, at 8,000 feet altitude, in marshy places. This is between *P. Parryi* and *P. nivalis*, Ledeb. but if the characters given in the Synoptical Flora are good this is a new species. I suppose this species is

the same as var. *Wilcoxiana*, Wood of *P. Parryi*, but I do not know that that was ever characterized in print.

GILIA PUNGENS Benth. is vespertine. I watched it on June 19, 1891, and found that the flowers opened after dark and closed at 7:30 o'clock A. M. I noticed the same thing in *G. Watsoni* Gray, and have no doubt that the same is true of *G. Californica* also. The flowers of *G. inconspicua* and *G. leptomeria* I have never seen fully opened except in sunny weather.

TRICARDIA WATSONI Gray I have found again in two places on Dutch Mountain, Western Utah. It is very rare.

ZYGADENUS PANICULATUS Watson is regarded as a good remedy for felon. The root is baked and applied to the sore.

EPHEDRA NEVADENSIS Watson is regarded as a cure for canker in the mouth and for diarrhœa. It will also produce the piles. The virtues seem to lie almost entirely in the pitch, which, when broken up, is a fine yellow powder and very powerful.

JUNIPERUS CALIFORNICUS Carr. var. UTAHENSIS, Eng. I saw this growing on the top of the Champlin Mountains, Utah, at 7,700 feet altitude, and all matted down and flat-topped, like *Abies fallax* and other conifers above timber line on our highest mountains.

PINUS MONOPHYLLA Torrey. This is very interesting in its young state. Until it is about 5 years old it is scarcely distinguishable from *Abies*. The primary leaves are an inch long, flat, and sharp. After that they grow shorter and little buds begin to appear in their axils: as these develop the leaves dry up and fall off, and there is a complete transition from the fully developed primary leaf to the minute bracts that subtend the young secondary leaves. Generally there are one or two cylindrical leaves scattered along the young stems and with their normal sheaths, while all around them are the primary leaves. I find that the leaves of *P. monophylla* are much more robust and vigorous than those of the variety *edulis* Jones, and so it is far more likely that *edulis* was derived from this than that *monophylla* was derived from it, as it can in no sense be considered a "depauperate form of *edulis*;" in addition, the cones are generally more robust and better developed, though there is an endless series of all sizes and shapes dependent upon the weather in August when the cones are growing. I find that the formation of seeds in the Western conifers, of our region at least, is due to the weather in August. If it

is rainy in that month, as is seldom the case, then the trees fruit abundantly, but if it is dry they seed but little or not at all.

INDICATIVE PLANTS.

Occasionally we are regaled with accounts of these plants, and one poor species after another is put forth as an infallible index of mineral. *Amorpha canescens* has recently been called the "lead plant," and it is stated that it indicates the presence of lead. If that be true, then the whole State of Iowa, especially the prairie portion, is a vast lead field. Unfortunately there is but little lead known in Iowa as a whole. *Eriogonum ovalifolium* is also made to do service for silver and arsenic in Montana. In Utah it is seldom found near silver mines, and when it so happens that they exist as low as the region that the plant frequents, then it is no more abundant there than it is over thousands of square miles that have no mineral. The plant abounds in all our valleys, and the color is either white or pink, and I dare say that arsenic has nothing to do with the coloring; it is far more likely that it is due to iron, which may or may not be near mines.

UTAH NAMES OF LOCALITIES.

In almost all the monographs and books giving localities of Utah plants the antique spelling of King's Report is adhered to. Isn't it about time that those relics are given a decent burial? They were invented by some enthusiast in Indian dialects who felt it necessary to put an "h" on every broad "a," whether it belonged there or not. Southern Utah is still groaning under the burden of the outlandish names applied to well-known and previously better named valleys, plateaus and mountains. It is no excuse for these that the names were given by the U. S. Geological Survey, for it has no right to change well-known names for those of its own creation. Some new names for well-known ones are as follows; Kaibab Plateau for Buckskin Mountains, Tushar Mountains for Beaver Mountains, House Range for Swazy Mountains, Wheeler's Peak for Jeff. Davis Peak, Toang Mountains for Toano Range, Mt. Emmons for Star Peak; among the outlandish names applied are Kaiparowits Plateau, Paunsagunt Plateau, Markagunt Plateau, etc.

Two of the bad spellings that I see most frequently in our botanical books are "Wahsatch" for Wasatch, the latter the correct one, and "Uintah" Mountains for Uinta Mountains. Coulter's Manual

errs on the former at all times, also all of Gray's and Watson's publications, and the monographers.

[I had supposed that I had made it sufficiently clear that I was the author of the var. *breviflorus* of *Cercocarpus parvifolius* Nutt. in the original paragraph in which it was printed, but it seems that there is at least one person who has not clearly understood it, so I will say again that the var. is to be credited to me alone.]

NOTES ON THE OCCURRENCE OF THE PUMA (*Felis concolor* L.) IN SOUTHERN NEW MEXICO.

BY C. H. TYLER TOWNSEND.

[Read before the New Mexico Society for the Advancement of Science, Dec. 1, 1892.]

A recent paper by Mr. F. W. True, in the report of the U. S. National Museum for 1888–89 (pp. 591–608, with plate XCIV), on the puma, or American lion, prompts me to record some available notes on the distribution of this animal in Southern New Mexico, since there seem to be no recorded instances of its occurrence in this part of the country.

The only case which I can personally vouch for is the following: While camped at the base of the Organ Mountains, at the northeastern end of the range, in the latter part of November, 1891, I saw a puma one morning about 8 o'clock disappearing over a ridge of rocks. He had emerged from the high and thick growth of *Yucca angustifolia* which covers the San Augustine plains at this point, and had disappeared before I could get a shot at him. One of the members of our party had passed within a few yards of a yucca, behind which he was crouching at the time, but without seeing him. He was apparently about three and one-half feet long, not including tail, and was of a yellowish gray color. Subsequent search among the rocks failed to show any trace of him. The same morning about three miles west of this place some Mexican goat herders reported that three tigers (*tigres*) had crossed the road at about eleven o'clock, going toward the mountains. This locality is about twenty miles east of Las Cruces, in Doña Ana County.

The following case was given me by Mr. W. E. Baker: In April, 1891, while driving toward Fort Stanton, in Lincoln County, on the

upper road, at a point less than three miles from and to the south of the fort, just after sundown, a puma was seen to spring up from the side of the road, a short distance ahead of the team. This point was not far from a draw containing timber. A shot was fired, which probably grazed the animal's back, for with a low yelp he made off down the wooded draw. The animal was estimated to be about three feet long, not including tail, and probably two and one-half feet high, and was doubtless not fully grown. He was of a tawny yellow color. This locality is on the U. S. Military Reservation at Fort Stanton, in Lincoln County. Some persons who came into Fort Stanton a day or two later on the lower road, reported seeing a puma the following night after the above one was seen. The lower road is about a mile west of the upper one at this point, running more or less parallel to it, and the wooded draw above mentioned connects the two roads. This was perhaps the same animal, therefore, that was fired at the night before.

The puma is not rare in Soledad Cañon, in the Organ Mountains, as the following cases will show: Mr. Jeff Isaacs, who has a ranch in the cañon, has killed twelve of these animals within the past four years. They have caused serious depredations among his lambs and colts. He tells me that they have killed five colts for him, and also numbers of calves and sheep. The skin of one which he killed with a pistol, in the fall of 1889, measured nine feet from end of nose to tip of tail. This measurement is vouched for by Mr. W. R. Fall, of this place. The cañon is a little south of east of Las Cruces, Mr. Isaac's place being about twenty miles from here.

Mr. Fall also tells me that Mr. G. R. Beasley, who has a ranch a mile or two beyond (east of) Isaac's ranch in Soledad, killed a puma in June, 1892, and says that there are several of these animals now alive in that vicinity.

In regard to the occurrence of the puma on the Upper and Lower Penasco, in western Lincoln County, Mr. S. E. Kennedy, of this place and formerly of Tularosa, vouches for the following: The skin of a puma killed by a man named Newman, near the head of the Penasco Creek, in the fall of 1891, measured eleven feet and some inches (three inches?) to tip of tail. Mr. Kennedy vouches for this measurement, which he made himself. This skin, therefore, is the longest one on record, the measurement of which is reliably vouched

for. I am unable, however, to give the length of the body and tail separately. The skin was measured in a straight line, and was of course somewhat stretched. The scalp was left on. The fur was of a tawny yellow color. Mr. Kennedy says that the puma is often met with on the Penasco, and states that the above-named Mr. Newman and a Mr. Wm. York have killed a great many in that region, the skins having been shipped by Mr. Kennedy to St. Louis, where they rarely brought more than $1.00 apiece. The average length of the skins, Mr. Kennedy states, is from seven to eight feet to tip of tail; but he asserts that he has received two or three which were over eleven feet long.

The government offers a bounty of $5.00 on the puma in this territory, and therefore the skins brought in usually lack the scalp.

NOTES ON FERTILIZATION.

BY ALICE J. MERRITT.

TRICHOSTEMA LANCEOLATUM Benth. The tube of the corolla is so bent back upon itself as to pretty effectually exclude small insects that could otherwise enter. Ants small enough to pass through the tube, were it not for the troublesome corner, are often seen upon the plants; but, though many flowers were examined to determine the method of fertilization, only one minute insect was found which had succeeded in reaching the nectar. The dusty color of the foliage renders this plant inconspicuous to a marked degree, but the bees seem to find it readily, aided doubtless by the strong odor, which probably warns grazing animals of its disagreeable taste. The bee whose visits were watched is an Anthophora. As it alights on the lower lip, its weight instantly straightens the tube, and brings the long curved stamens and pistil against its back with sufficient force to discharge much pollen. A bee too small to be struck by the stamens would have too short a tongue to reach the nectar. The anthers shed their pollen before the stigma matures, so that the bee, in passing from the younger flowers near the top of the stem to the more mature flowers at the bottom of the next cluster, is sure to effect cross fertilization. It is uncertain whether the stigmas mature soon enough to be fertilized by their own pollen should cross fertilization fail.

ZAUSCHNERIA CALIFORNICA Presl. The flowers have an oblique position, with stamens and style close against the lower petals and sepals. After the anthers begin to discharge their pollen, the style lengthens until it is from ¼ to ½ inch beyond them before it unfolds its four lobes and exposes the rough, sticky, stigmatic surface. The pollen is collected in little balls of a few grains each, and these balls are held loosely together and to the anthers by cobwebby hairs. The calyx tube is much constricted above the nectar. The humming birds are frequent visitors to these brilliant flowers, and they can hardly fail to carry pollen on their throats or breasts. I have watched Zauschneria when there were throngs of bees frequenting less showy flowers near by and have seen but one bee visit it. Probably the shape of the flower prevents them from getting the nectar. Its little bronze green visitor, however, seems small enough to reach the constriction, and has, perhaps, a tongue sufficiently long to go through to the nectar, after emerging from the tube. This bee invariably paused on the lower margin of the flower, and seemed to be cleaning its antennæ. In this process some pollen usually became attached to its legs and abdomen and might sometimes adhere to the stigma of another flower. This, however, was not observed. Zauschneria seems to have some chance for close fertilization. Of course, if the pollen simply fell, it would strike the under side of the stigma lobes, not the stigmatic surface; but it usually remains attached to the anthers for some time after the stigma is exposed, and the little masses sometimes swing down on their gossamer threads so far that the slightest jar would send them against their own stigma. During a morning's walk three flowers were seen that had been fertilized in rather a novel way. A seed of the plant, with its tuft of hairs, had been blown against a pollen mass with sufficient force to land it all on the stigma.

BIOLOGICAL NOTES ON PHAINOPEPLA NITENS.

BY F. E. BLAISDELL.

The Phainopepla is a conspicuous summer resident in the western part of San Diego County, where it is admired for its black, glossy plumage, airy and graceful flight. Even within this region of its distribution there are some localities where it is rarely seen, and this is no doubt due to the absence of its food plants and scarcity of trees.

As a general thing it is rarely observed near the coast, except along the San Diego and Sweetwater Rivers, where willows, cottonwood and oak trees are abundant, and the adjacent hills covered with shrub oak, sumachs, buckthorn, and sage. Rarely seen on the mesas about San Diego and other regions where *Adenostoma fasciculatum*, *A. sparsifolium*, *Hosackia glabra*, *Rhus ovata*, *R. integrifolia* constitute the main flora. With the increased planting of orchards in these localities it is becoming more common.

It is occasionally observed at Coronado since the planting of the avenues with *Eucalyptus*, *Cupressus macrocarpa*, *Olea Europæa*, *Abies excelsa*, *Schinus molle*, *Ficus carica*, *Grevillea robusta*, *Citrus* and palms, but I have never observed it nesting there. In favorable localities it is common and breeds.

Among children and those not conversant with ornithology it is known by the following names:—

Black Crested Flycatcher, Black Mocking Bird, Mountain Phœbe, and Red Eyes.

The Phainopepla arrives at Poway about the first of May, the males usually arriving several days before the females. They are rarely seen after the middle of August.

Poway Valley is situated twenty miles northeast of San Diego, fourteen miles from the seacoast, and thirty miles distant from the edge of the coniferous belt, with an elevation of 700 feet.

The principal plants of this region are: *Quercus dumosa*, *Q. agrifolia*, *Platanus racemosus*, *Populus Wislizeni*,* *Alnus oblongifolia*,* species of *Salix*, *Rhus laurina*, *Rhamnus crocea*, *Prunus demissa*,* *Sambucus glauca*, *Ceanothus sorediatus*,* *Adenostoma sparsifolium*, *A. fasciculatum*, *Artemisia Californica*, *Opuntia occidentalis*, *O. prolifera*.

Shortly after arrival the male selects a site for a nest and proceeds to its construction, which may be completed before the female arrives, but if not she assists. Late arrivals commence labor together. The mates make alternate trips to and from the nest in search of building material, one remaining upon the slowly growing nest, arranging the last accession and pressing it into place; as the returning mate approaches, they exchange a purring salutation and exchange places. The nests are placed at varying distances from the

*But sparsely distributed.

ground, from four to even fifty feet. The materials used are prickly or viscid. The fruit and leaves of some of the members of the Borage family have the preference, together with the leaves and down of species of *Gnaphalium*, all being bound together by spiders' web; the interior of the nest is thinly lined with bits of wool, hair, and down. When completed the nest is fragile, and not sufficient to support the rapidly growing young, and if not placed on a good support, is very liable to give way, and endanger its inmates to the perils of a fall.

The eggs are two (frequently), three (usually), or four (rarely), in number. The mates take turns in the act of incubation. The young are abundantly fed on the berries of *Rhamnus crocea*, *Rhus laurina*, and near to and within the coniferous belt upon the fruit of *Rhamnus Californica*. When disturbed the young birds disgorge the ingesta. The food of the adults consists of berries and insects, and they are beneficial rather than injurious about orchards.

MARIPOSA COUNTY AS A BOTANICAL DISTRICT.

IV.

BY J. W. CONGDON.

THE SUBALPINE REGION.

We have now reached that portion of our county which forms in summer by far its most pleasant and beautiful region. It consists of several uneven plateaus lying between the higher ridges of the mountains and also includes the tops of the lower ridges. While the sides of the mountains up to the limit of tree growth and much of the more level ground are covered with heavy timber, there are, along the water courses, many large open natural meadows where the luxuriant grass, mingled with numberless flowers of varied and beautiful hues, form in this State almost our only representatives of the luxuriant meadows of the east.

The altitude of this region varies from 4,000 to 8,500 feet, thus including all the lower and wooded mountains, and it extends up the higher ones to the upper limit of trees, which is usually about 8,000 feet or a little more.

This tract is pierced by two deep valleys,—the Yosemite and Wawona Valleys, occupied respectively by the main Merced River and the South Fork. The vegetation of these valleys, the floor of which lies from 2,000 to 4,000 feet below the subalpine region proper, consequently includes a larger proportion of plants which belong lower down; but these lower levels are too narrow, and the cliffs that border them and furnish the life-giving supplies of water are so lofty and so full of subalpine vegetation themselves, that they furnish the great majority of the species and control the general character of the vegetation. Hence, in these articles, these great valleys will be considered in connection with the great plateaus through which they cut their deep and narrow channels.

The trees of this region include all or nearly all of those belonging to the coniferous belt. Mingled with these are found the splendid red fir of the Sierras (*Abies magnifica* Murr.); the Jeffrey or black pine (*Pinus Jeffreyi* Murr.); and the tamarack pine (*Pinus murrayana*, Murr., *P. contorta* var. Bot. Cal.) In the upper part of this region the mountain white pine (*Pinus monticola* Dougl.) and the mountain spruce (*Tsuga Pattoniana* Engelm.) become common, while in the Big Tree Grove, south of the South Fork, the huge Sequoias (*S. gigantea* Decaisne) occupy a limited space, fortunately preserved from the spoliation of the lumbermen.

The less heavy and continuous forest, the more open country, and the greater variety of soil and exposure, combine to produce a much more abundant and varied vegetation, while the neighborhood of the loftier summits and the abundance of water prevent the excessive heat and horrible dryness which, in the foothills, makes life in the summer a burden and outdoor activity during the greater part of the day terribly exhausting and often positively dangerous.

These circumstances tend to make this whole region the most delightful and healthful summer resort in our State. While the stupendous scenery and the pleasant climate of the Yosemite are a perpetual feast to the lingering as well as the transient visitor, the other portions of this region, though they may not boast such grand scenery, yet have compensating advantages which make them even more attractive to the seekers for health and rest who desire to make a longer and more leisurely stay than the ordinary tourist. For such of these who prefer or are compelled to limit themselves to

established routes and demand the luxurious accommodations of the modern summer resort, Wawona offers a really pleasanter summer home than the valley itself, under present conditions. But for those seeking pleasure or science who find it agreeable for a while at least to escape the burdens as well as the luxuries of our pampered civilization and enjoy a brief season in the solitary woods and mountains, this furnishes the best possible opportunity for the gratification of their desires. The high plateaus adjacent to Mt. Raymond and the Big Trees, the great divide between the south fork and the main Merced River, over which the Glacier Point Turnpike passes, and still more the region north of the Yosemite, including Lake Tenaya and extending out of the county to the Soda Springs of the Tuolumne, offer to camping parties of the right kind the most delightful opportunities for a stay of weeks or even months. In this last locality they are brought within easy access of all the high mountains in that quarter. Cathedral Peak and Mts. Conness, Dana, Lyell, Gibbs and others form the ramparts of a vast amphitheater, and are easily within the reach of those ambitious of high ascents, while all may enjoy the beautiful and exhilarating climate and other manifold attractions which make life here delightful. Nearly the whole of this region is within the limits of the national park, a circumstance which by wholly excluding the vast bands of sheep that formerly devoured almost every green thing and denuded the natural meadows of every vestige of grass, has made it more accessible to visitors, since there is abundance of forage for the requisite animals and the surface of the country itself is far more luxuriant and beautiful.

Coming now to a more particular description of the flora of this subalpine region, we refer the reader to former articles for the many species which, occurring first in the coniferous belt, extend into and often become more abundant in this, as well as for the few which, beginning below the coniferous belt, ascend above its limits.

In the following list Y, as heretofore, indicates a plane of the Yosemite Valley. W. indicates one of the Wawona valley, and M. G. one chiefly found in the Mariposa grove of big trees, while the other abbreviations also have the same meaning as before.

Thalictrum occidentale Gray. Borders of meadows.

sparsiflorum Turcz. Banks of streams, 7,000 feet and above.

Ranunculus Flammula L. var. reptans Meyer. Y. & C.
alismæfolius Geyer. Crescent Lake.
occidentalis Nutt. var. tenellus Gray. W.
Caltha biflora DC. Crescent Lake. A.
Aquilegia cærulea James. Y. Cultivated from native specimens.
Delphinium decorum F. & M. var. patens Gray. Crescent Lake.
Andersonii Gray. Upper Yosemite Creek.
scopulorum Gray, var. glaucum Gray. Buck Camp, 7,000 feet.
Aconitum Columbianum Nutt. Buck Camp. Upper Yosemite Creek.
Draba stenoloba Ledeb. Y. (Bot. Cal.)
crassifolia Graham. Peregoy's.
Arabis platysperma Gray. Dry slopes, 6,000 to 7,000 feet.
repanda Wats. Y. W.
Holboellii Hornem. Y.
Erysimum asperum DC. var. pumilum Wats. Crescent Lake.
Sisymbrium incisum Engelm. Cloud's Rest.
Nasturtium sinuatum Nutt. Y. W.
Subularia aquatica L. Crescent Lake.
Viola blanda Willd. Y. Crescent Lake.
glabella Nutt. Occasional, 6,000 feet.
Stellaria crispa C. & S. Y. Cliffs, etc.
umbellata Turcz. Buck Camp.
longipes Goldie. Everywhere.
Jamesii Torr. Y. Frequent below 7,5 00 feet.
Arenaria capillaris Poir. Glacier Lake.
Calandrinia pygmæa Gray. A. Buck Camp, 7,500 feet and above.
Claytonia Chamissonis Esch. Frequent at 6,000 feet and above.
triphylla Wats. Frequent at 6,000 feet and above.
Spraguea umbellata Torr. Sandy soil but rare below 6,000 feet
Linum digynum Gray. Yosemite Trail (Bot. Cal.)
Geranium Richardsoni F. & M. Buck Camp.
incisum Nutt. Y. W. etc.
Ceanothus prostratus Benth. Rocks at about 6,000 feet.
Acer glabrum Torr. Yosemite cliffs.

Lupinus ornatus Dougl. Crescent Lake.
sericeus Pursh. Mts. Buena Vista and Surprise, 8,000 feet.
confertus Kell. Glacier Point Turnpike, etc. Y.
Andersoni var. Grayi Wats. W.
parviflorus Nutt. Y.
laxiflorus Dougl. Inspiration Point, etc.
minimus Dougl. Lake Tenaya.
Breweri Gray. Above Yosemite 7,000 feet. Crescent Lake.
Trifolium longipes Nutt. Peregoy's, etc.
Bolanderi Gray. Peregoy's, etc.
monanthum Gray. W. Glacier Point Turnpike.
Hosackia Torreyi Gray. W. 5,000 feet.
Astragalus Bolanderi Gray. South of Yosemite. 7,000 feet.
Spiræa betulifolia Pallas. Y., etc.
discolor Pursh. var. dumosa Wats. 7,000 feet.
Geum macrophyllum Willd. Y. W.
Fragaria Virginiana Ehr. var. Illinoensis Gray. Y.
Potentilla gracilis Dougl. var. rigida Wats. Y.
Grayi Wats. Peregoy's. Base of Mt. Hoffman, 7,000 feet.
gelida C. A. Meyer. Crescent Lake.
Horkelia fusca Lindl. Y. and above.
tridentata Torr. Y. W.
Ivesia unguiculata Gray. Y. (Bot. Cal.)
santolinoides Gray. South of Yosemite. 7,000 feet.
Pyrus occidentalis Wats. Crescent Lake, etc. 7,000 feet.
Saxifraga occidentalis Wats. Yosemite Cliffs.
bryophora Gray. Foot of Mt. Surprise, 7,500 feet.
Boykinia major Gray. Y. M. G.
Bolandra Californica Gray. Yosemite Cliffs.
Tellima tenella Walp. Yosemite Cliffs.
Mitella Breweri Gray. Peregoy's, etc., 7,500 feet.
Heuchera rubescens Torr. Yosemite Cliffs.
Parnassia palustris L. var. Californica Gray. Meadows. (Bot. Cal.)
Ribes oxyacanthoides L. Lake Tenaya.
lacustre Poir var. molle Gray. Lake Tenaya.
cereum Dougl. South of Yosemite.
viscosissimum Pursh. Yosemite Cliffs

Epilobium spicatum Lam. W., etc. 5,000 and 6,000 feet.
Watsoni Barbey. Cloud's Rest.
alpinum L. Summit Chowchilla Mountain, etc.
origanifolium Lam. Same region as last. A.
brevistylum Barbey.? W.
glaberrimum Barbey. Common at 5,000 and 6,000 feet.
Gayophytum racemosum T. & G. Frequent.
pumilum Wats. Signal Pk.
Sanicula Nevadensis Wats. 5,000 feet.
Carum Howellii C. & R. W. Snow Creek. 3,300 feet.
Eulophus (Podosciadium) Bolanderi C. & R. Yosemite Cliffs, etc.
Ligusticum apiifolium B. & H. Y. (Bot. Cal.)
Grayi C. & R. Crescent Lake, etc., 7,000 feet.
Cymopterus terebinthinus T. & G. Y., etc.
Garrya Fremontii Torr. Yosemite Cliffs, etc.
Lonicera conjugialis Kell. Glacier Point, Crescent Lake. 7,000 feet.
cærulea L. Crescent Lake
Kellogia galioides Torr. W. Frequent at 5,000 and 6,000 feet.
Galium bifolium Wats. Peregoy's, etc. 7,000 feet.
pubens Gray. Y. W. 5,000 feet.
Valeriana sylvatica Banks. Y. and above. A.
Eupatorium occidentale Hook. Mt. Buena Vista. Yosemite Cliffs. A.
Brickellia grandiflora Nutt. Y.
Chrysopsis Breweri Gray. Woods, 6,000 to 8,000 feet.
Aplopappus Whitneyi Gray. Wooded slopes, 7,000 feet.
cuneatus Gray. Rocks. Y. & C. 6,000 feet.
Bloomeri Gray. South of Yosemite. 7,000 feet.
Aster campestris Nutt var. Bloomeri Gray. Lake Tenaya.
adscendens Lindl. Y. Crescent Lake, etc.
integrifolius Nutt. Crescent Lake, etc. 7,500 feet.
occidentalis Nutt. Y. and W. Common, 5,000 feet.
Fremonti Gray. Yosemite region.
Andersoni Gray. South of Yosemite. Abundant on shores of subalpine lakes, 7,000 feet and above.
Erigeron salsuginosus Gray. Yosemite Cliffs. Crescent Lake. 7,500 feet.
Breweri Gray. W. Y. Below 6,000 feet.

Antennaria dioica Gaertn. Yosemite Cliffs, Crescent Lake, etc.
Rudbeckia Californica Gray. M. G.
Wyethia mollis Gray. Y. and above Lake Tenaya.
Madia Bolanderi Gray. M. G.
Hemizonella minima Gray. Above Yosemite. (Bot. Cal.)
Whitneya dealbata Gray. M. G., etc., 6,000 feet.
Hulsea brevifolia Gray. Y. and above.
Chænactis Douglasii H. & A. W. Y., etc.
Artemisia tridentata Nutt. Y.
  Rothrockii Gray. Crescent Lake. A.
Senecio lugens Richardson. Crescent Lake, etc.
  triangularis Hook. M. G. Common at 5,000 to 6,000 feet.
Arnica cordifolia Hook. Yosemite Cliffs.
  Chamissonis Less. Yosemite Cliffs.
  viscosa Gray. Base Cloud's Rest.
Phalacroseris Bolanderi Gray. South of Yosemite. 7,000 feet.
Stephanomeria lactucina Gray. M. G.
Crepis acuminata Nutt. Buck Camp. 7,500 feet. A.
Troximon Nuttallii Gray. Base Cloud's Rest.
Hieracium horridum Fries. (Breweri Gray.) 7,500 feet above Yosemite.
  albiflorum Hook var. flavum. Nevada Falls trail.
Vaccinium myrtillus L. Crescent Lake.
    var. microphyllum Hook. Same.
  occidentale Gray. South of Yosemite. 7,500 feet.
Arctostaphylos Nevadensis Gray. Not rare at 7,000 feet.
Leucothöe Davisiæ Torr. Signal Pk. 6,000 feet.
Kalmia glauca L. Crescent Lake, etc. 7,500 feet.
Ledum glandulosum Nutt. Chihuahua Creek. 6,500 feet.
Pyrola secunda Ait. Occasional above 7,000 feet.
Sarcodes sanguinea Torr. W. Common at 5,000 to 7,000 feet in the woods.
Pleuricospora fimbriolata Gray. M. G., etc.
Gentiana Amarella L. var. acuta Hook. Above Yosemite. (Bot. Cal.)
  simplex Gray. South of Yosemite, 7,000 feet.
  Newberryi Gray. Slopes of Mt. Buena Vista, 8,000 feet.
Frasera speciosa Dougl. Glacier Point.

Menyanthes trifoliata L. Crescent Lake.
Phlox Douglasii Hook. Above Yosemite, etc. 7,000 feet. A.
Gilia tenella Gray. South of Yosemite. (Bot. Cal.)
pungens Benth. Y.
aggregata Spreng. Above Yosemite, etc. 7,000 feet.
leptomeria Gray. Goose Lake. 6,500 feet.
Polemonium humile Willd. South of Yosemite. 7,000 feet.
Phacelia hydrophylloides Torr. Occasional at 6,000 feet.
pusilla Torr. Lake Tenaya.
Hesperochiron Californicus Wats. Peregoy's.
Mertensia Sibirica Don. Common at 6,500 feet, etc.
Echinospermum diffusum Lehm. South of Yosemite. 7,000 feet.
floribundum Lehm. Same region.
Collinsia Torreyi Gray. Y. Common below 7,000 feet.
Penstemon Menziesii Hook. Y.
confertus Dougl. Y. Also A. in dwarf form.
lætus Gray. Y. and above.
Mimulus leptaleus Gray. Glacier Point, Turnpike, etc. 6,000 feet.
Torreyi Gray. Not rare at 4,000 to 5,000 feet.
Lewisii Pursh. Chihuahua Creek, etc. 7,000 feet.
laciniatus Gray. Y. W.
rubellus Gray. Peregoy's.
n. sp. Glacier Point Turnpike.
mephiticus Greene. Glacier Point. Lake Tenaya. A.
primuloides Benth. Y. & C. 5,000 to 6,oco feet.
Veronica alpina L. Crescent Lake. 7,500 feet.
Castilleia affinis Hook & Arn. Y. Crescent Lake, etc.
Lemmoni Gray. Lake Tenaya.
Orthocarpus lacerus Benth. Y. and above.
Pedicularis Grœnlandica Retz. Lake Tenaya.
attollens Gray. Crescent Lake.
semibarbata Gray. Forests at 5,000 feet.
Utricularia vulgaris L. Y.
Rumex paucifolius Nutt. Little Yosemite, Lake Tenaya.

Polygonum minimum Wats. Lake Tenaya.
ramosissimum Michx. Y.
tenue Michx. Y. and above.
Bidwelliæ Wats. Crescent Lake.
Bistorta. L. Y. and above.
polymorphum Ledeb. Glacier Point, Lake Tenaya.
Eriogonum stellatum Benth. Crescent Lake.
Torreyanum Gray. Crescent Lake.
incanum T. & G. Nevada Falls trail. 7,000 feet. A.
marifolium T. & G. Nevada Falls trail. 7,000 feet. A.
spergulinum Gray. Peregoy's, etc. 7,000 feet. A.
Wrightii Torr. Chihuahua Falls. 6,000 feet.
Myrica Hartwegi Wats. Banks of Big Creek. 5,000 feet.
Salix Sitchensis Sanson. Glacier Point Turnpike.
Lemmoni Bebb. Not rare at 4,000 and 5,000 feet.
Californica Bebb. Crescent Lake.
Populus trichocarpa T. & G. Y.
Castanopsis chrysophylla. A. DC. W., etc. 5,000 to 6,000 feet.
Phoradendron Bolleanum Eichl. Signal Pk., etc., on Abies concolor.
Juniperinum Engelm. Common on Libocedrus at 5,000 feet.
Arceuthobium Americanum Nutt. Little Yosemite on Pinus Murrayana.
Juniperus occidentalis Hook. Nevada Falls. Lake Tenaya.
Sequoia gigantea Decaisne. M. G.
Abies magnifica Murr. Glacier Point, etc. 7,000 feet.
Tsuga Pattoniana Engelm.
Pinus monticola Dougl. Not rare at 7,000 and 8,000 feet. A.
Jeffreyi Murr. Glacier Pt., etc. 6,000 to 7,000 feet.
Murrayana Balf. Y. and more common above 7,000 feet.
Habenaria leucostachys Wats. Brooks at 5,000 to 7,000 feet.
sparsiflora Wats. Summit Mt. Chowchilla, 6,500 feet.
hyperborea R. Br. Crescent Lake.
Goodyera Menziesii Lindl. Pine forests at 4,500 to 6,000 feet.
Epipactis gigantea Dougl. Chihuahua Creek. 6,000 feet.
Cypripedium montanum Dougl. W. Y.
Iris longipetala Herb. Y.

Sisyrinchium Californicum Ait.
Allium validum Wats. Buck Camp, Lake Tenaya. 7,500 feet.
Sanbornii Wood. Y. (Bot. Cal.)
bisceptrum Wats. Crescent Lake, etc.
tribracteatum Torr. Glacier Lake.
Camassia Leichtlinii Wats. Meadows, Glacier Pt. Turnpike.
Lilium parvum Kell. Y. and above.
Veratrum Californicum Durand. W. Crescent Lake.
Zygadenus venenosus Wats. Y. and above.
Sparganium simplex Huds. Crescent Lake, etc.
Potamogeton Claytonii Tuck. Y. (Bot. Cal.)
natans L. Crescent Lake.
Luzula spadicea DC. var. melanocarpa Meyer. Not rare at 6,000 feet and above.
divaricata Wats. Base of Mt. Hoffman.
Juncus Drummondii Meyer. Crescent Lake, etc. 7,000 feet. A.
Nevadensis Wats. Crescent Lake, etc. 7,000 feet. A.
oxymeris Engelm. W. M. G.
phæocephalus Engelm. Not rare, 5,000 feet and above.
obtusatus Engelm. Big Creek, 5,000 feet.
chlorocephalus Engelm. Y. Tenaya trail.
Scirpus carinatus Gray. Y.
sylvaticus L. var. digynus Bœckl. Buck Camp.
criniger Gray. Lake Tenaya.
Hemicarpha occidentalis Gray. Sandy beds of Merced and South Fork.
Eleocharis obtusa Schultes. Y.
Fimbristylis capillaris Gray. Y.
Carex filifolia Nutt. Nevada Falls trail, Lake Tenaya. 7,000 feet. A.
Douglasii Boott. Y. (Bot. Cal.)
Hoodii Boott. Y. (Bot. Cal.)
illita Bailey. Y. and above.
specifica Bailey. Yosemite region.
straminea Schk. var. congesta Boott. A. Above 7,000 feet.
athrostachya Olney. Y.
tenuirostris Olney. Lake Tenaya.
canescens. L. W. (Bot. Cal.)

Carex echinata Murr. Above 4,500 feet.
scoparia Schk. var. fulva W. Boott. Above 5,000 feet.
adusta Boott. W. and above.
quadrifida Bailey. Lake Tenaya.
Raynoldsii Dewey. Lake Tenaya.
globosa Boott. Yosemite Cliffs, etc.
amplifolia Boott. W.
Yosemitana Bailey. Y.
Whitneyi Olney. Y.
Sartwelliana Olney. Y.
luzulæfolia Boott. Crescent Lake.
fulva Good var. Hornschuchiana Boott. Y.
lanuginosa Boott. Yosemite region. W.
trichocarpa Muhl var. imberbis Gray. Royal Arch Lake.
vesicaria L. Y.
utriculata Boott. Royal Arch Lake.

Phleum alpinum L. Glacier Point. Meadows, etc., 7,000 feet. A.

Sporobolus depauperatus Scrib. Y.
gracillimus Vasey. Y. and above.

Agrostis æquivalvis Trin. M. G. (Bot. Cal.)
exarata Trin. Frequent above 4,500 feet. A.
varians Trin.? Mt. Buena Vista. A.
elata Trin. Y.
scabra Willd. Everywhere above 4,000 feet.

Cinna arundinacea L. Royal Arch Lake, etc.

Muhlenbergia gracilis Trin. Y. (Bot. Cal.) Lake Tenaya.

Vaseya comata Thurb. Y. and above.

Deyeuxia Canadensis Beauv. Royal Arch Lake.
Langsdorffii Kunth. Crescent Lake, etc., 7,000 feet.
stricta Trin. Yosemite region.

Stipa occidentalis Thurb. Frequent above 7,000 feet. A.
Kingii Boland. Lake Tenaya.

Danthonia sericea Nutt. Yosemite trail. (Bot. Cal.)

Trisetum subspicatum Beauv. Frequent. A. Above 7,000 feet.
var. molle Gray. Frequent. A. Above 7,000 feet.

Deschampsia cæspitosa Beauv. Crescent Lake. Lake Tenaya. A.

Melica stricta Boland. Yosemite Cliffs.
fugax Boland. Frequent above 6,000 feet.
Glyceria fluitans. R. Br. Y.
nervata Trin. Frequent above 4,000 feet.
pauciflora Presl. W., etc.
Agropyrum violaceum Lange. Upper slopes of the mountains. A.
Cheilanthes Californica Mett. Y.
Pellæa Breweri Eaton. Yosemite Cliffs.
densa Hook. Yosemite Cliffs.
Bridgesii Hook. Yosemite Cliffs.
Cryptogramme acrostichoides. R. Br. Yosemite Cliffs. Mountain slopes.
Aspidium Nevadense Eaton.

These species, 295 in number, of which only 21 are certainly known to extend above to the proper alpine heights, taken with the 39 species in common with the plains and lower foothills, and the 75 species which reach here from the coniferous belt, make a total of 409 native species, which constitute the entire proper flora of the district. Scarcely a trace of the naturalized plants of the lower regions here appears except in the cultivated grounds at Wawona and in the Yosemite, and no attempt is here made to take any account of them nor of some common plants that are limited to the cultivated fields and meadows in both valleys, and are as much introduced plants where they are found as the recognized weeds that grow with them.

NOTES ON OTTERS.

BY SAM HUBBARD, JR.

SEA OTTER (*Enhydris lutris*).

The coast of Washington from Gray's Harbor north to Cape Flattery is the only part of the United States in which the sea otter is now hunted outside of Alaska. This interesting and valuable fur bearer, unlike its cousin, the land otter, lives in the ocean, and is rarely known to come ashore. A full-grown sea otter is about as large as a setter dog, with a thick, chunky head, and a mouth full of formidable looking teeth. It has short fore legs, not over six or

eight inches long, terminating in soft, round paws, while instead of having hind legs like a land otter it has seal-like flippers, but unlike the seal the otter has a round tail about a foot long, covered with beautiful fur.

In color otters vary somewhat. The young are a rich brown; from this they change, in the adult animal, into a deep, glossy black, the more valuable skins being sprinkled with long white hairs, giving that silver-gray appearance which is so much prized. As they grow older the white hairs predominate, so that some of the largest skins will be grizzled gray all over, lighter on the belly and darker on the back. The skin is very loose, lying almost in folds, so that from an animal but little over three feet in length comes a skin which easily stretches to six feet and over. The fur is very thick and beautiful, and nearly an inch long, and has no full covering of thick, coarse hair, as in the case of beaver and land otter skins.

Mr. Damon, who lives on Damon's Point, which is the north spit at the entrance of Gray's Harbor, once caught a young otter which had wandered into the bay and become stranded on a sand spit near his house. He brought the little fellow home, provided him with a tub of water, and gave him all the care possible, but during the night he escaped from the tub and was found dead in the morning.

I also saw a cub that was killed by the Indians at the Quinault Reservation. It was brown all over, and the skin was worth about fifteen dollars.

Their principal food consists of clams and crabs, but they doubtless catch some fish also. They obtain their food by diving for it right in the edge of the surf, and it seems as though the heavier the breakers the more they enjoy the sport. When they catch crabs (which seem to form their principal diet), they come to the surface of the water, and, floating on their backs, place the crabs on their breasts and proceed to tear them to pieces with their short fore paws. The Indians also claim that they carry their young in the same manner. Many of the larger skins have a worn spot on the breast owing to its constant use as a table.

There are some large beds of kelp a few miles off the coast, and on these the young are born, usually two in number. Owing to the fact of these animals living all the year round in the cold waters of the North Pacific, the fur seems to be just as good in the summer as it is in the winter.

They are hunted by both white men and Indians, who shoot them with heavy rifles especially manufactured for long-range purposes. This is probably the most difficult rifle shooting in the world, the successful hunter requiring extraordinary skill and vast patience, plentifully sprinkled with good luck. In the first place the otter is very shy, and all shooting is done at from two to six hundred yards. Then the otter merely shows his head and a small portion of his hips, which makes a very small mark at that distance. Again he rarely approaches shore except in rough weather, so that he is always bobbing up and down on the big rollers, and usually with a high wind blowing. With all these difficulties to contend with it is no wonder that several hundred shots are fired to each otter obtained, and also that from two to four otters are considered a good year's work. The price of skins on the beach ranges from $50 to $250 each according to size and quality, the average being somewhere near $125. Twenty or thirty years ago the otters were much more plentiful than at present, bands of several hundred being seen at a time, and in those days the hunter would get as many in a month as he now gets in a year, but at the same time the price of the skins was about half what it is at present.

When the white men first began to make a business of hunting otter in the palmy days of old, when they were plentiful, they selected spruce trees which stood conveniently close to the water, and constructed platforms in them about twenty or thirty feet from the ground. From these elevated stages they could overlook the surf and discern their game much more readily than from the beach. As the otters became wilder and kept farther away, the necessity for something better presented itself, so they constructed what are known as derricks, made of three long poles set up like a tripod and surmounted on top by a small wooden box open at the top and one side. These derricks are set up on the beach about half way between high and low water, the box, or crow's nest, standing about twenty feet above the sand.

The hunter enters this as the tide is coming in, so that at high water he is on an elevated perch right in the midst of the breakers. He is kept a prisoner there, however, until the tide recedes sufficiently to allow him to go ashore. If he is fortunate enough to kill an otter he makes a note of the condition of the tide, the force and

direction of the wind, the drift of the current, etc. Then he patrols the beach in the direction in which the otter is liable to come ashore, and patiently waits for it to come in. This sometimes takes two days, but they all of them come ashore sooner or later. He also tells his comrades, who likewise watch the beach, and they always respect each other's property. When hunters were more numerous than they are at present they used to brand their bullets as an additional means of identification.

In the summer season when the weather is settled the Indians of the Quinault Reservation venture out into the ocean in their canoes and attack the otter out at sea. The white hunters object strongly to this method of hunting, as they claim it makes the otters even wilder than they are at present. Undoubtedly many otters are hit that get away badly wounded. This is particularly the case when pursued by the Indians in their canoes. They are not as good shots as the white hunters, and then they often find bands of otter and shoot indiscriminately into the bunch.

Probably the most successful white hunter on the beach is a man named Wetherell, who has hunted there a long time and has killed a great many otters. About half way between Gray's Harbor and the Quinault River is the Copalis Rock, which stands in the ocean some 600 yards from the beach. This rock has very precipitous sides and its summit is perhaps forty feet above the water on a calm day, but when there is a storm the great rollers come in and dash themselves against this bold sentinel until the spray runs in snowy cascades down his grim sides and the shock of the impact makes him tremble to the very foundation. On this wild spot Wetherell determined to build a house and shoot sea otter—and he did it.

The rock can only be approached in calm weather, so with the aid of some Indians and their canoes he carried lumber out there and built a small hut on the highest point of the rock and securely bolted it down. He carried out food and water and here he used to stay, sometimes kept prisoner for three or four weeks at a time, but enjoying magnificent opportunities to shoot otters as they swam by. He established a code of signals and also had a blackboard on which he used to write the direction a dead otter was drifting. This was read by means of a glass by his confederates on shore, who picked them up as they drifted in. This was a very successful stand for a

long time, until they shot there so much that the otters became alarmed and have ever since given the rock a wide berth. The otters have other enemies as well as man. This was demonstrated to my satisfaction by finding on the beach a dead one that had been killed at sea. It had several long cuts in the skin and a great bruise as though it had been bitten by some large animal. The otter hunters said that it had probably been attacked by a shark or a sea lion while lying asleep on the water. The otter probably had strength enough to escape from its assailant, but finally succumbed to its wounds. There was a peculiar crease on one of the hind flippers, which, on skinning, proved to be an old bullet wound, as small pieces of lead were found imbedded in the bone.

The otter was quite fat and perfectly fresh when found. The fur was glossy black, changing to dark brown underneath. The skin was bought by a trader and fur buyer, who paid $65 for it.

NORTH AMERICAN OTTER (*Lutra canadensis*).

Quinault Lake is in that forest wilderness that borders the Pacific Ocean in the extreme western part of the great State of Washington.

The lake is about fifty miles north of Gray's Harbor and some thirty miles east of the ocean, and is drained by a fine river of the same name, timbered along its shores by firs, hemlocks and cedars.

It is only within the last five years that this interesting country has been explored by white men, consequently wild animals are still tolerably abundant and may occasionally be seen in their native fastnesses.

One beautiful evening in August I sat in my canoe about a quarter of a mile down the river from the lake and just above the first rapid. The shadows had grown quite long, the millers and caddis flies had come out of their leafy retreats and were flying over the stream, while the eager trout were breaking water and exposing their silvery sides with a recklessness that made my fisherman's heart beat stronger. The last fly had been fastened on the leader and I had just seized the pole to push into the stream when some animals on the opposite side of the river caught my eye. The first thought that flashed through my mind was muskrats. No, they are too active for muskrats; then they must be mink; too large for mink: they were otters. What a good time they were having too!

Fortunately the rifle was in the canoe, so I paddled quietly across

the stream, being careful to keep above them. The wind was blowing up stream from them towards me, so they did not scent me and appeared entirely unsuspicious.

I was now within fifty yards of them; so as quietly as possible I laid down the paddle and, picking up the rifle, let the boat drift. The current carried me rapidly toward the otters and I was just about to shoot when the canoe quietly grounded on a submerged rock and hung poised in mid stream. I was now within thirty yards of the game and had an unobstructed view of all their movements.

There were six of them in all, four pups and two adults. They were diving for fish and each one that went down came up with a trout in his mouth. He would then gulp him down without going ashore, and at once dive for another. Their heads sticking above the water, their mouths wide open, with the white of their lips and gums showing, reminded me of a lot of rubber tubes.

There was a moss-covered root sticking out of the water near by, and every now and then a couple of the pups would climb out on this and chase each other and play like two kittens.

While I watched them they caught six or eight trout from four to six inches in length, bolting them down with evident relish.

All this time, however, the current was taking the older ones, who seemed to do most of the fishing, further down the stream. This was a reminder that it was time for me to take a hand in the game. I waited until two of the pups crawled out on the root, and drawing down as fine as possible on one of them I pressed the trigger.

Between those forest walls the roar of the gun sounded like a small cannon. For a few seconds there was a great splashing and commotion and then all was still. Not an otter was to be seen. I had apparently missed a dead shot. Impelled by a vicious shove from the setting pole, the canoe shot alongside the root, and there, struggling in the water behind it, was a fine young otter with a bullet hole through his head.

Otters sometimes follow down the streams of this region into tide water. An old trapper once showed me an otter slide on the muddy banks of the Hoquiam River not two miles from Gray's Harbor, the river at this point being a slough in which the tide ebbs and flows. The slide was very faintly indicated and I should never have known what it was if he had not pointed it out to me. Young otter are readily tamed and make most interesting and pretty pets.

THE EFFECT OF CLIMATE UPON PACIFIC COAST BIRDS.

BY L. BELDING.

It has been the custom of American ornithologists to refer to the birds of the damp forests on the coasts of Northern California, Oregon, Washington, and British Columbia as the "dark, northwest coast birds;" of the birds of the arid treeless areas east of the Cascade and Sierra Nevada Mountains, of the Mojave and Colorado deserts and Arizona, as the "bleached desert races;" of the resident peculiar forms of the Sacramento and San Joaquin valleys, as birds of the "dry, hot interior," thus referring to localized forms, which migrate little, if at all, and in the terms quoted, correctly conveying the idea that the environment or climate inhabited by these forms is the cause of their divergence from nearly related species and sub-species. A familiar axiom carrying the same idea is, "Migration holds species fast, localization lets them slip," the purport of which is that birds which migrate and are subject to many conditions are much less liable to change than those which do not migrate and are subject to few conditions. Whatever potency natural selection or sexual selection may have in causing differentiation—and their operation in this direction seems very obscure—here, where there is such variety of climate, soil, and vegetation, consequent upon difference in altitude and humidity, proximity to the ocean and removal from it, we may well consider climate as our most important factor in evolution.

Turning from birds to man, we see in our country, descendants of people of various European nationalities who bear the impress of our climate and the distinctive characteristics of Americans. Even the pure-blooded Jew, whose occupations and modes of living vary but little, is similarly affected, and I have noticed that the English Jew resembles, more or less, the Englishman, the German Jew the German, and I think the Polish Jew is different from any of these. It is difficult to see how selection could have had much influence in modifying the Jew.

The black man appears to be one of the natural products of Africa, the copper-colored man of America, but I would not venture to predict that the Caucasian and negro of America will in the dim future become copper colored, and that our vexatious race problem will in this way be solved, but I do venture to protest against giving the theory of selection undue prominence.

A NEW JUMPING SPIDER.

BY JOHN L. CURTIS.

The subject of the following description is a spider which has been carefully studied by the writer for some time past. It was recently submitted to Prof. G. W. Peckham, who has pronounced it a new species of the genus Dendryphantes. Accordingly, I have thought it timely to publish a short description of the spider, together with such notes on habits, etc., as I have collected. The following will, I think, sufficiently identify it.

DENDRYPHANTES ÆNEOLUS.

Total length, 5.4 mm.; width of abdomen, 2.2 mm.

Cephalothorax, length, 2.4 mm.; width, 2.2; height, 1.8 mm.

Legs, 8.3 mm., 5 mm, 4.6 mm., 6.2 mm. Patella and tibia of the first, 2.7 mm.; patella and tibia of 2d, 1.6 mm.; patella and tibia of 3d, 1.6 mm.; patella and tibia of the 4th, 2 mm.; metatarsus and tarsus of the 4th, 1.6 mm.

Total length, 6.7 mm.; width of abdomen, 2.6 mm.

Cephalothorax length, 2.6 mm.; width, 2 mm.; height, 1.6 mm.

Legs, 6.2 mm., 4.9 mm., 4.4 mm., 5.9 mm. Patella and tibia of 1st, 2 mm.; patella and tibia of 2d, 1.6 mm.; patella and tibia of 3d, 1.2 mm; patella and tibia of 4th, 1.8 mm.; metatarsus and tarsus of 4th, 1.7 mm.

♂♀ Cephalothorax moderately high, convex, a very little dilated behind dorsal eyes with sides nearly vertical in front and rounded behind. Ephalic part level, thoracic part falling rather abruptly. Quadrangle of eyes occupying one-third of cephalothorax, one-half wider than long, same width before and behind. First row of eyes bent, inclined slightly downward, middle eyes sub-touching, lateral about one-third as large as middle eyes and separated from them by one-fourth of their own diameter. Eyes of second row midway between dorsal and lateral eyes ♂, a little farther from dorsal than from lateral eyes ♀. Dorsal eyes a little smaller than lateral eyes, farther from each other than from lateral borders, forming a row as wide as the cephalothorax at that place. Clypeus perhaps inclined a little backwards, one-third as high as middle eyes in ♂, four-fifths as high as middle eyes in ♀. Falces wider than the two middle eyes, reaching to inner margins of lateral eyes, once and a half as long as face ♂♀, divergent, inclined slightly forward. Fang strong ♂, vertical, paral-

lel; fang weaker ♀. Maxillæ blunt, cut on inner margin toward labium. Labium a little longer than wide, more than one-half as long as maxillæ; sternum oval, three-fourths longer than wide, projecting between anterior coxæ. Anterior coxæ separated by a little more than the width of the labium, much larger and longer than the others, smaller and shorter in ♀ than in ♂. Legs of first pair much larger and longer than the others ♂, somewhat larger and longer than the others ♀. Femoral joints compressed and enlarged. A few spines on femur, patella, tibia and tarsus and metatarsus of first leg, all but the patella of second, third and fourth legs, in terminal ring on tarsus of third and fourth. In the first and second pairs the spines are most numerous on the inner side of the leg. A few femoral spines on the palpi.

COLORATION.

FEMALE.—Upper cephalothorax grayish-brown with slight bronze cast and a space of polished black posteriorly just in front of the abdominal juncture. Under side black with long white hairs sparse.

The background color of upper abdomen is black or deep brown, with a heavy bronze cast over all. Beginning at the spinnerets and extending about four-fifths of the abdominal length, are two narrow, black or deep brown bands. Between these bands anteriorly is a light, tawny-yellowish area divided centrally by a dark streak. More of this yellowish color is seen along outside the bands and on the forepart of the abdomen. There is a border of the same around the anterior rim. Upon each of the black bands are four spots of the same. Side abdomen light gray, under side same, darker along the median line.

MALE.—The upper cephalothorax is usually black or has the gray-brown color only in patches. The chief difference is in the upper abdomen, which has the same ground-color and bronze cast but no yellow markings except the anterior and side rim. The bands are obliterated, but often the posterior yellow spots remain.*

EXPLANATION OF MARKINGS.

The gray-brown color of the cephalothorax is due to short, stout, slightly iridescent yellow scale-hairs scattered over the black integu-

*The foregoing description was made with a lens of a power of four or five diameters. The following was made with a compound microscope of about fifty diameters.

ment. The side color is due to the same scales and the black line along the rim is due to the absence of them. The yellowish clypeus is caused partly by long hairs and partly by scales. In the male the coloring of the clypeus is not so clearly yellow because the hairs and scales are sparser. In the upper cephalothorax these yellowish scales are interspersed with other scale-hairs of like shape but of a grayish color and most brilliant iridescence, which are particularly numerous on the forepart and produce the bronze luster. In some, especially in young specimens, these scale-hairs are thick all over.

The skin color of the upper abdomen is deep brown or black, usually appearing brown to the eye but under the microscope black with long black hairs. The yellow markings are formed of hairs like those on the cephalothorax, while the longitudinal dark bands are simply parts of the dark integument set in relief by the yellow scale-hairs. The yellow along outside of bands is in natural females a close collection of these scales, but in gravid females it appears as a series of oblique, backward streaks, one from each of the dots on the bands. This indicates weak portions of the integument, which stretch to make room for the eggs. Bronze hairs also, like those on the cephalothorax, are thickly set between the bands posteriorly, outside the bands anteriorly, and on the forepart of the abdomen. Others are scattered among the yellow hairs. The yellow border in both sexes is composed in part of longer hairs than those forming the other markings. The dark upper abdomen of the male is due to the absence of yellow scale-hairs, although there are enough bronze scale-hairs to give it a luster. The under abdomen has the same black skin covered with nearly white scale-hairs of a smaller size than the yellow ones. They are not so thickly set along the middle and the skin shows through, forming the darker central band. Male legs dark brown with darker brown rings, as follows: Last half of femur dark brown with tip end lighter; last end of tibia gradually darker; light scale-hairs on all except first two joints. The second pair of legs have dark rings on patella, tibia and tarsus; metatarsus with a black tip; scales as in first pair; third and fourth pair same. Palpi light brown, last joint dark, dark hairs on last joints, light hairs on others; light yellow scales on femur and two succeeding joints; mouth-parts, coxæ and sternum dark brown; anterior coxæ darker than posterior; falces nearly black; fang red-brown.

Female, first and second leg of a uniform light-brown with a black tip, light and dark hairs, sparse scale-hairs on all except first two joints. Third and fourth legs same with tarsus and metatarsus lighter. Some have a narrow dark ring on tibia of the third and fourth pairs; others have a dark ring on patella, tibia, and tarsus of the same. Palpi light-brown with light hairs.

The markings of this spider often rub off, giving rise to individual differences.

This brilliant bit of a spider is quite common about San Francisco Bay, but has not yet been reported elsewhere. It is found on many plants, but in gardens where I have observed it most, it is more frequently seen on honeysuckle, rose bushes, live-oaks, and the shrub known as laurestina. The last two seem to offer peculiar advantages, for not only do the leaves lie closely together, but the oak leaves are curled and the laurestina leaves are quite often rolled lengthwise. Between two leaves in the one case, or within the rolled leaf in the other, the spider finds a safe retreat, while the dead live-oak leaves, where they lodge together in hollows, furnish spacious cavities between them for the web domiciles.

The domicile is a simple flat tube, open at both ends, with sometimes an open branch tube from the main one. The spider enters by inserting the fore legs between the sheets of webbing and holding them apart as it forces its way in. If there is danger of intruding foes, the spider holds the sheets together with the fore legs at the end most threatened.

The flat cocoon which contains the yellowish eggs is made within the tube, and the young ones share the parent domicile until after the second moult, when they depart on aeronautic tours of exploration for themselves.

The males and females appear as adults as early as April, but the former become rare after the first of June and the latter after the first of September. The females begin laying eggs in May. The number of cocoons made by a single female is not more than two, and probably, judging from captives, the general rule is to make but one. The eggs, about fifty in number, hatch on the average in about twenty-five days, and the young are found at all times of the year.

DENDRYPHANTES ÆNEOLUS is one of our so-called flying spiders, the young being especially given to that progressive method of loco-

motion. Often, when sitting in the garden, I have had one alight on my book, crawl to the top of my uplifted finger or pencil, and fly away on its web or make it a bridge to some other and usually higher point. The way of getting upon the breeze is in principle the same as with all other flyers. Arrived at the top of an elevation, the spider raises the spinnerets and emits a thread, which the wind is allowed to carry far enough to bear. If this is successful, it flies, but if the thread catches, it simply fastens it where it stands, draws it in, as it were hand over hand, until taut, and then crawls upon it to the other attachment. In most cases the fly-line flows from the posterior spinnerets, while from the anterior pair another thread is drawn, and fastened to the point upon which the insect stands, so that it has a returning line if the flying, at first successful, should afterward end in failure. If the fly-line catches, the extra line simply strengthens the first end of it, or affords return, should it break.

It can easily be seen that this way of traveling must be exceedingly advantageous to these spiders, not only because of the ease and speed which the web bridge allows, in crossing water, desert places, patches of grass or clover and other obstructed routes, but also because of the much greater speed and safety afforded by actual flight. With spiders, as with men, however, the easiest and speediest ways are most likely to be disastrous, as is shown in the following instance, which illustrates as well the instinctive endowment enabling this spider to overcome its natural enemies.

On a bright morning several years ago a pet lizard lay sunning himself on a table in the yard, when a partly grown specimen of this spider came sailing along and dropped down directly in front of him. For a second or two the spider, unconscious of the great impending danger, looked about in the seemingly intelligent way peculiar to Attidæ. The lizard, as yet sluggish and unawakened, was pushed toward it. Instantly the careless attitude of the spider was changed for the strategic; facing its enemy, it slowly, almost imperceptibly, drew in its legs until it looked more like a tiny chip or the top of a polished nail-head than like a spider. The saurian was then moved around behind; *æneolus*, with fixed eyes and cautious movements, turned to face him still. I put my fingers just behind the spider, but it chose to face the greater, and, from the spider standpoint, more imminent foe, and kept its eyes on the lizard. After testing in various ways without touching it, I now slightly pushed

the spider from behind with a pencil. With a sudden side jump and a rapid dash along beside the lizard, it crawled under his outstretched tail and dropped over the edge of the table into the grass. If the lizard had been lively, the spider would not have fared so well, but as it was, it not only escaped, but had more scope for showing its instinct. In the first place, instinct seemed to tell that lizards are dangerous animals. That is curious enough in itself. In the second place, it had learned, or secured by inheritance, the exact strategem which could save it from such enemies, if anything could. A lizard never devours an insect that does not very perceptibly move. A third conclusion that I drew was that the spider knew which was the most dangerous end of the reptile. At any rate, it ran under the tail, and, though in a decided hurry, seemed to feel safer out of range of the lizard's eyes than in running straight on to the other end of the table. Making due allowance for any imagination of mine on the last point, it must be conceded that such knowledge of lizard habits in a spider shows considerable intelligence.

NOTES ON HISTERIDÆ OBSERVED IN SAN DIEGO COUNTY.

BY F. E. BLAISDELL.

HOLOLEPTA. This genus is represented by six well-defined species, two of which I shall describe as new. The individuals of each, with two exceptions, are quite numerous in their season.

HOLOLEPTA YUCATECA Mars. Found in the decaying fruit of *Cucurbita*, *Echinocactus viridescens*, leaves and stalks of *Opuntia occidentalis*. The largest species of the genus, body greatly depressed, head extended, with long, prominent mandibles. Mentum flat, impunctate; prosternum narrowed, and rounded at tip; sides of body more or less arcuate. Rather plentiful from May to November.

HOLOLEPTA PERVALIDA sp. nov. Form strongly oblong, narrower and much less depressed than *yucateca;* sides parallel. Mentum nearly flat, strongly punctate laterally, rather sparsely so at middle; prosternum intermediate between the preceding species and

fossularis; mandibles rather strongly curved and shorter. Length 17.5 mm. Rare. Found in decaying *Echinocactus viridescens.*

HOLOLEPTA CACTI Lec. Very abundant in decaying cacti, frequently taken from beneath the bark of decaying and water-soaked wood of the willow. Mentum concave, with strongly elevated lines; prosternum narrowed and almost acute at tip.

HOLOLEPTA VICINA Lec. Common from July to November. Found in the decaying fruit of *Cucurbita.* Mentum concave without elevated lines; prosternum slightly narrowed, truncate, and slightly emarginate at tip.

HOLOLEPTA NEGLECTA sp. nov. Narrower and more elongate than *vicina.* Mentum feebly concave, lines rudimentary; prosternum slightly narrowed, subtruncate. Sides of prothorax quite evenly arcuate. Sides of body moderately arcuate. Length 7 mm. Found in decaying squashes. Rare. This species was identified for me as *lucida*, but is entirely different in habitat from specimens subsequently obtained of that species.

HOLOLEPTA POPULNEA Lec. Taken from decaying cacti in the eastern or desert portion of the county; common in Arizona.

HISTER SELLATUS Lec. Not common; in spring and early summer observed flying about sandy places near streams, also found about the roots of plants. Elytra are marked with red.

HISTER SEXSTRIATUS Lec. Common; observed flying about on warm days in spring, also found at the roots of grasses and beneath bark in rotten wood; a large black species.

HISTER MILITARIS Horn. In some seasons quite common. Frequents the sandy banks of streams, and beneath débris in same locality. Smaller species with each elytron marked with a red line.

TRIBALISTER MARGINELLUS Lec. Rare; taken from beneath rocks in moist places.

TRIBALUS CALIFORNICUS Horn. A very small species and abundant beneath bark, rocks, etc., in permanently moist places. I once observed some six or eight individuals feeding upon a living *Melanotus longulus.*

PAROMALUS OPUNTIÆ Lec. Common; found in decaying fruit of species of *Cucurbita*, leaves and stalks of *Opuntia occidentalis.*

PAROMALUS CONSORS Lec. Common; frequents decaying vegetable matter.

SAPRINUS OREGONENSIS Lec. Common about fetid vegetable and animal matter.

SAPRINUS LUBRICUS Lec. and S. FRIMBRIATUS Lec. Abundant everywhere, especially along the seashore about putrefying matter.

SAPRINUS CÆRULESCENS Lec. Quite common in summer about the dead bodies of snakes and small mammals.

SAPRINUS SULCIFRONS Lec. Common along the seashore beneath kelp.

VIEWS OF A WORKING BOTANIST ON THE NEW AMERICAN RULES OF NOMENCLATURE.

BY J. H. CONGDON.

Five of these rules are simply the practice of all good botanists concisely expressed, and need no comment. No. VIII will never be followed. It is simply an extravagant but logical extension of the principle so rigidly expressed in rule No. 1.

The sooner No. 4 falls into a state of innocuous desuetude, the better. It will certainly get there.

As for No. 1, in the rigid construction that will be claimed for it, it is a deliberate sacrifice of the rights of the great majority of us to the vagaries of individuals. Where all the botanists of a country have for a generation agreed on the use of certain names for the vegetation of their own country, and everyone has learned them and become familiar with them, we do not intend to suffer some old pamphlet to be dug up by some musing bookworm from some pile of forgotten rubbish in some back closet in some old library three thousand miles away, where some old pedant has given a vague description from some traveler's scrap of a plant which the author never saw growing and really knows nothing about, to make all the rest of us take up our botanical lists, which have become as familiar to us as our alphabet, and rub out the old names associated with years of study and observation in the field, and put in their miserable resuscitated antiquities. We shall do nothing of the kind. We shall stick to the old familiar words and leave the works of those that adopt these new-old names to repose in the antiquated dust from which they were dug.

SOME NOTES ON AZOLLA.

BY DOUGLAS HOUGHTON CAMPBELL.

One of the most interesting of the native Pteridophytes of California is the widely distributed *Azolla filiculoides*, occasionally called "water-fern." This pretty little plant is common in many localities, and when found at all, usually occurs in great numbers, and often covers extensive stretches of quiet water with a dense purple-red mantle so thick that the water is completely hidden. Sometimes, however, a pond that is completely covered with the plant, may, after a few months, show no trace of it beyond a few decaying fragments that have sunk to the bottom, or are entangled among the Lemna and other floating weeds on the surface. Whether this sudden disappearance is due simply to the plant's having completed its natural term of existence, or to some other cause, I am unable to say. A pond near the La Honda road, some dozen miles back of Palo Alto, was visited repeatedly between November 1891 and May 1892, and at all times was covered with a luxuriant growth of Azolla. The same pond visited in September, showed not a single living plant, although ripe spores were found in the decaying masses of plants at the bottom of the pond, and these germinated promptly when set free and placed in clear water. The pond has not been visited since, so I cannot say whether or not a new generation of plants has appeared.

The genus Azolla is a small one, but widely distributed. Of the four species usually recognized, two are American, viz.: *A. filiculoides* and *A. Caroliniana*; *A. nilotica* is African, and *A. pinnata* is Asiatic and Australasian. Both *A. filiculoides* and *A. Caroliniana* are attributed to California, but all specimens yet seen by me have belonged to the former species, and as these included some from the collection of the Academy of Sciences labeled *A. Caroliniana*, I have some doubts about this species occurring here. This is the species of the eastern part of the continent, where it is widely distributed and reaches as far south as Brazil. *A. filiculoides* occurs in Chile and Peru, and probably pretty much all along the Pacific Coast.

As the life history of all the species was very imperfectly known, an effort was made to clear up as far as possible the obscure points. To this end observations were begun in November, 1891, and continued, with more or less interruption, for a year. Only a few of the more important and general points brought out by these investi-

gations will be given here, as the details will be given in a somewhat extended paper that has just been completed.

The plants multiply very rapidly by the detachment of branches at the base, which become independent plants, and in this way the plant spreads with great rapidity when once established. Besides this method of multiplication, spores are formed which give rise to a new generation of plants.

The spores are of two kinds, large ones (macrospores), and small ones (microspores). The sporangea that contain these are borne in separate receptacles, which usually occur in pairs. These are borne on the lowest leaf of a branch, and an investigation of their earlier stages shows that they are metamorphosed leaf-segments. The ordinary leaves are divided almost to the base, into two lobes, and in the sporiferous leaves, one of these lobes is transformed into the rudiments of the sporocarps. This lobe is first divided into two equal parts by a median cell wall, and each half then grows by an apical cell to form the rudiments of the young sporocarp. At a very early stage a ring-like wall is formed around the base of each rudiment, and rapidly grows until it forms a cup, in which is contained the papilla-like sporangial receptacle. This cup finally closes at the top and thus forms the closed capsule in which the sporangia are borne. In the smaller sporocarps a single macrosporangium, which almost completely fills it, is formed, and this originates directly from the apical cell of the sporocarp-rudiment. The microsporangia are produced many together, and the sporocarps containing them are larger. The development of the two sorts of sporangia is at first much the same, and follows closely that of the ordinary ferns, so much so, indeed, as to leave no doubt that Azolla is closely related to them.

A comparison of the whole sporocarp with the sorus of certain ferns shows that its wall is really homologous with the indusium of the latter.

If we examine the earlier stages of the macrosporangium we cannot fail to be struck with its extraordinary resemblance to the young ovule of many phanerogams, and the form and position of the indusium suggest immediately its homology with the first integument of the ovule. This is not so surprising when we remember that the ovule is really nothing but a specially modified sporangium.

Up to a certain point the two kinds of sporangia develop alike, but a difference becomes evident just before the formation of the spores.

In the macrosporangium but eight spore mother cells are produced, while in the microsporangium there are sixteen. In both cases, each spore mother cell divides into four, in the usual way; but whereas all of these develop more or less perfectly in the microsporangium, only one comes to maturity in the macrosporangium, and develops into the single large spore that fills its cavity.

Shortly before maturity the protoplasmic matter filling the microsporangium separates into several masses (massulæ) each of which encloses a number of spores. The substance of the mature massulæ has a peculiar foamy appearance, and looks almost like a cellular tissue, but examination shows that it is only hardened protoplastic matter, and that the peculiar cellular appearance is caused by vacuoles in it. In stained sections of the nearly ripe sporangium, the nuclei of the disorganized tapetal cells can still be seen lying in the spaces between the massulæ, and are evidently concerned in the formation of the glochidia, curious anchor-like outgrowths of the massulæ.

In the macrosporangium the protoplasmic matter surrounding the spore is used to build up the curious epispore and appendages. The epispore in *Azolla filiculoides* is composed of a substance very simiiar to that of the massulæ. It is provided with prominent irregular knobs that have attached to them numerous fine threads. The upper part of the spore is crowned with three pear-shaped masses of the same substance as the epispore. The ripe macrospore fills the sporangium so completely, and the latter fits so closely into the indusium, that its wall is so compressed as to be only discernible after close scrutiny.

The sporangia are set free by the decay of the indusium, but this decay is only partial in the case of the macrosporangium, and the upper part of the indusium becomes hard and dark-colored, and persists as a little cap, covering the top of the spore, whose base finally becomes entirely free by the decay of the sporangium wall. As the massulæ escape from the microsporangium, by the complete disorganization of its wall, the glochidia stand out from them and by their hooked ends become fastened to the threads that cover the prominences on the surface of the macrospore, and often the massulæ are so numerous as to completely hide the lower part of the macrospore. This is obviously a great assistance in fertilization, as the germinating microspores are thus brought close to the macrospore.

In order to study the germination of the spores, sections must be

made, as the first stages take place within the completely closed spore. From the macrospore a small triangular prothallium is produced, which breaks open the apex of the spore, and pushes up between the three appendages on the top. A single archegonium is formed at a very early stage, in the center. This resembles in its essential features the archegonium of the ordinary ferns. In case the first archegonium is not fecundated, several others may be formed, but the growth of the prothallium is limited, and appears to cease after the reserve fund in the spore is used up. If the first archegonium is fertilized, the egg-cell after secreting a cellulose wall about itself divides by a transverse wall. From the upper of the two primary cells the stem and fine leaf of the young plant arise; from the lower, the primary root and the foot (the organ by which the embryo absorbs its nourishment from the spore).

The microspore produces an extremely simple prothallium bearing a single antheridium.

The ripe spores sink promptly when placed in clear water, but as the embryo develops, large intercellular spaces are formed, which, filling with gases, cause the young plant to rise to the surface.

The development of the prothallium, so far as could be determined, is completed in about one week from the beginning of germination; and it is almost as long before the young plant rises to the surface of the water. These figures are necessarily only approximate, as there is no means of telling how far germination has advanced without killing the plant, and there is a great deal of difference in the time when germination begins.

All species of Azolla have always associated with them a nostoc-like plant of the genus Anabæna. The necklace-like chains of cells of this plant are always found tangled about the growing point of the Azolla stem, and as the leaves develop, a cavity is formed in each one, into which the Anabæna filaments creep and form a colony. They do not seem to affect the growth of the Azolla, but are simply sheltered by it. As the sporocarps are forming, the Anabæna makes its way into the open top where the cells enter a resting condition to assume growth again when the spores germinate. When this takes place, the Anabæna filaments surround the growing point of the embryo, which is thus brought into contact with the parasite from the very first.

NOTES CONCERNING THE FLORA OF SONORA.

BY T. S. BRANDEGEE.

Early in May the writer landed at Guaymas, the seaport of the State of Sonora, Mexico. This month of the year is never a good one for observing the vegetation of the region, for the ground has completely lost the moisture acquired during the rainy season, and no new showers are to be expected immediately. The time of my visit was unusually unfavorable, for the rainfall of the preceding rainy season had been small, and the vegetation of a dry earth under a burning sun showed fewer signs of life than usual. The surface of the country about Guaymas is very much diversified and eminently suitable for a varied flora; the city itself is almost surrounded by high cliffs and steep hills; the large harbor contains many islands, some rocky and abrupt, some of a more gentle and rolling character, and some extending into long sand-spits, but slightly elevated above high tide. Its waters find their way into numerous small bays, situated behind ridges and extending to the openings of long cañons, all of which can easily be visited by obtaining the assistance of the clamorous boatmen. Any botanical collector who reaches this place is likely to be visited by the same thoughts that often occurred to me when, after climbing a high hill, I saw from the shade of some rock the exquisite panorama spread out before me, and pictured the glorious time Dr. Edward Palmer must have enjoyed, when, climbing the rough hills covered with vegetation, crawling among rocks steaming from recent rains, and sailing around and about the islands and neighboring shores, he so carefully collected a flora then almost unknown and abounding in species new to the scientific world. A few plants were found, however, that do not seem to have been before noticed. One, that disagreeable bush *Atamisquea emarginata*, was seen on the hills near the coast, and as later it was often met with in the neighborhood of Hermosillo, it must be a common plant of this part of Sonora. *Helianthus dealbatus*, in a depauperate form, was found growing on one of the long sand-spits, and as its habitat was supposed to be the seashore sands between San Quentin and Magdalena Bay, this locality considerably extends its range. *Palafoxia linearis* also grows in sandy locations, and in saline soil near tide water bushes of *Avicennia nitida* are sometimes seen.

The cacti of the vicinity of Guaymas seem to have been somewhat neglected and are not noticed in the accounts of its flora. Of course they are difficult plants to make into botanical specimens, and disagreeable to come in contact with, but some of them, when in bloom, are very attractive, and there is a species of Platopuntia, often growing among nearly black rocks that contrast so strongly with its bright red joints as to make it seem from a distance like a mass of brilliantly colored flowers, in fact at first I made the boatman land me on the rocks, which I climbed, so as to be certain what it might be. This cactus is known as "durasnillas," and a little village near Hermosillo that we visited later is named from it Las Durasnillas. A few plants of a scarlet-flowered cereus grow on a sandy island, and afterwards it was seen in abundance in the interior.

Near the city and in many parts of Sonora, *Cereus Schottii*, which on the peninsula received not long ago the additional name *C. Sargentianus*, is common and assumes the various forms in which it grows on the peninsula of Lower California. The most distinct is the one in which the top bears spines similar to the lower part, and, although flower-bearing, large and old, entirely lacks those long white spines so characteristic of this species.

Notwithstanding the adverse conditions, some of the well known plants of the Guaymas flora were in full bloom. *Hofmeisteria crassifolia* blooms in the dry season, as does its near ally, *H. fasciculata*, of Cabo San Lucas, and was now crowned by its myriad of light-pink flowers, and like its Lower Californian relative delights to grow on cliffs just beyond the reach of the ocean spray. Now and then a small tree of *Guaiacum Coulteri* disdaining to follow the example of the other members of its species, covered its leafless branches with a mass of dark sky-blue flowers, and the brilliant effect of its erratic conduct was increased by the staidness of its surroundings, for it was a cloud of blue amongst a crowd of leafless grayish-brown bushes, resting on an ash-colored and baked adobe soil.

Cæsalpinia, *Hyptis*, *Jacquinia*, and other shrubs were evidently endeavoring to produce blossoms and fruit, but the drought was so excessive that only withered flowers were the result. That slender, drooping acacia, *A. Willardiana*, full of flowers and ripe pods, was found to be abundant on rocky ledges west of the city, and again later I was pleased to see it growing on a rocky hill almost within the city limits of Hermosillo.

The street railway of Guaymas ends in a semi-public park, in which grow two trees with willow-like leaves that would not be recognized as belonging to the fig family by anyone knowing only the cultivated figs of California. The owner says they were brought from below San Blas, and Dr. Palmer says that at least one of them grows also wild in the neighboring cañons. These two trees from which were collected the typical specimens of *Ficus fasciculata* and *F. Sonoræ*, are separated by a short distance; one bears numerous aerial rootlets and sends down to the earth roots from its branches; the other has neither of these peculiarities, but, as *F. Palmeri*, of Lower California, sometimes produces an abundance of aerial rootlets, and more often has none, their presence or absence cannot be considered a specific character. The two trees of Guaymas bear a general resemblance to one another; the leaves are alike, and at the time I thought they were one species, and afterwards was surprised to learn from Dr. Palmer that they represented types of two distinct species. Dr. Gustav Eisen, a well-known expert in fig culture, who has seen these same two trees, thinks it possible that they may represent the male and female forms of a single species, and says: "*F. fasciculata* possesses in the April crop of figs very few male flowers, about half a dozen to each fig, and these male flowers are situated in the region around the eye (osteolar region), and are not found dispersed among the female and gall flowers lower down."

Along the railway from Guaymas to Hermosillo and in the surrounding region, one of the most abundant plants is the thorny bush, or small tree, *Olneya Tesota*. At this time all its flowers were open, and they were so numerous that horses and cattle become fat eating them from the branches within reach, and from the ground where they have fallen.

The irrigated fields and gardens about Hermosillo were quite green when compared with the surrounding country, and much vegetation of interest was found, especially along the ditches and in the hedge rows. The dry rocks and hills of course did not produce many plants at this time of the year, but some collections of Perityle made among them, and by Dr. Eisen at San Miguel de Horcasitas, gave evidence that the awns of the pappus may be present or absent in the same species. *Hiræa macroptera*, a perennial plant, very common in the vicinity of Hermosillo, does not seem to suffer from the lack of moisture, for along the roads and in the very driest situations

its bright yellow flowers and winged seeds flourish amongst the surrounding dried-out vegetation.

The most interesting part of Sonora visited was Las Durasnillas, a small collection of houses about sixty miles from Hermosillo, near a mountain range known as Sierra Matapan. At this place was found a flora very different from any before seen, and some moist localities along the base of the mountain had retained their green and growing vegetation longer than was to have been expected. The most conspicuous plant was *Cæsalpinia pulcherrima*, with its large and handsome blossoms, compelling admiration from the least attentive. The very dark-purple flowered *Brongniartia Palmeri* was equally abundant. Some of the Pithecolobiums were in bloom, and under one of them our camp was made, as they furnished more shade than any other tree of the region, but a denser shade would have been more agreeable, because the hot sun found many openings among the scattered leaves and branches through which to send its rays. Among the trees and shrubs some are so different from familiar forms that they are a constant source of interest, and even the inhabitants recognized their peculiarities, and, after exciting our curiosity, guided us to the places where they grew. The cotton tree, *Eriodendron acuminatum*, is a singular tree, having the bark of its trunk thickly covered with large thorns, with leaves like those of the buckeye or horsechestnut, and large yellow flowers that are followed by bolls of cotton four or five inches long. When the fruit bursts and the tips of the twigs and branches of a spreading tree twenty feet high are adorned with good-sized bunches of cotton, the effect is very striking. Another tree, with a trunk sometimes two feet in diameter, that is always nearly white, and for that reason called "Palo blanco," surprises even botanists when they observe its botanical relationship, for it is an Ipomœa, a genus seen in more temperate climates only as low twining herbaceous plants. Among so many interesting plants, a few others are deserving of notice. Erythrina is represented by a single species here, and in Lower California by another very distinct one; both blossom in the spring, some time before the appearance of the leaves, and both retain their long pods after the short-lived foliage has fallen. The abundant large, dark maroon colored flowers are as beautiful in April as are the open pods that expose their scarlet beans in December. *Cordia Sonoræ* is completely covered with flowers that persist on the bushes and assume different shades of

color as they wither. In the cañons is *Vitex mollis*, a tree that is often planted in the gardens of Hermosillo, and many other plants interesting botanically, among which the following, which seem to have been undescribed, were found:—

ABUTILON (WISSADULA) CINCTUM. Perennial, 4–6 dm. high, stems slender, diffusely branching, white, with a thin appressed tomentum: leaves cordate-ovate, crenate-serrate, acute, on slender pedicels of about the same length, upper surface appressed pubescent, pubescence of the lower mixed with stellate hairs: flowers solitary on stout pedicels shorter than the petioles, not jointed: bracts linear-oblong, caducous: calyx cuneate at base, 10-angulate, cleft less than half its length into five lanceolate acute lobes, covered with long spreading hairs, which also occur sparingly on petioles, peduncles, and on the margins and veins of the leaves: corolla 1/2–2 dm. broad, light-purple or lilac, segments cuneate-obovate, inequilateral, twice the length of calyx, tomentose in the angles, erose at summit: stamineal column very short, horizontal: stamens 2/3 the length of the petals; anthers by the unusual development of the double septum, spuriously two-celled, developing a large quantity of mucus when wetted: ovary 3-celled; ovules three in each cell, the two upper collateral; styles three, capitate, united only at base, minutely and sparsely stellate hairy; carpels three, rounded at apex, loculicidally-dehiscent to the base within, two-thirds the length without, constricted below the middle by a callous ring which is higher anteriorly and posteriorly than at the sides; upper seeds smooth, lower conformed in shape to the cavity, tuberculate punctate at the sides, and crowned by a hirsute ring; radicle superior.

This plant hardly belongs to the genus Wissadula, yet according to Grisebach's Flora of the West Indies, it would be included in the Wissadula section of Abutilon. The constriction between the upper and lower cells is not very apparent externally and does not amount to occlusion of the lower, but insomuch as it approaches Abutilon weakens Wissadula. The shortening of the stamineal column the tricarpellary ovary and collateral ovules occur in other species of Abutilon. It was collected near Las Durasnillas, Sonora, Mexico.

ANISACANTHUS ABDITUS. Perennial, the few stems virgate, indurated herbaceous, bearing short branches, leaves and flowers above, the whole plant minutely puberulent and abounding in stipitate

glands: leaves ovate-lanceolate, 2–3 cm. in length on slender petioles more than half as long, the uppermost reduced to sessile bracts: proper bracts lighter green than the leaves, ovate-lanceolate, a pair sessile in each of the upper axils, 8–12 mm. long, nearly twice the length of the concealed calyx: flowers sessile, one or two in each pair of bracts: calyx cleft to the base, lobes lanceolate-acuminate: corolla rose-color 3–4 cm. long, the rather slender tube somewhat curved and a little longer than the nearly equally cleft and spreading lobes: anther cells muticous, parallel, one very slightly lengthened below: capsule oblong, 2 cm. long, the stipe-like portion occupying half the length; seeds flattened but thick, apparently violet in color, covered with short, sinuous ridges.

This plant was found growing about a spring on the Sierra Matapan. Its habit and flowers resemble those of related species, but its large bracts, of a lighter color than the leaves, make this a very distinct one, and the numerous blossoms crowded at the upper part of the stems surpass in beauty those of the well-known members of the genus Anisacanthus.

MAMILLARIA NOTESTEINII BRITTON.

Since the sending of my first specimen to Dr. Britton I have found quite a plantation of them, and after examining a number have thought it best to modify the original description.

MAMILLARIA NOTESTEINII Britton, stems ovate, simple, or occasionally cæspitose, 2—8 cm. in diameter. Tubercles nearly terete and about 2 cm. long, spines 12—18 white, becoming gray with age, weak and slender, 1—2 cm. long, spreading. The central spine, which is longer and stronger than the others, is generally tipped with reddish-pink. Pubescent throughout. Flowers 2—4 cm. in diameter, ash-gray, tinged and penciled with a delicate pink. Petals linear oblong, mucronate tipped; sepals fringed; fruit scarlet, obovate; seed black, globose, pitted. Soil and exposure to sunshine changed the amount of coloring and penciling.

Found by the writer in gravelly soil, near a small creek, in this vicinity, June 4, 1891. F. N. NOTESTEIN.

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NOTES ON THE ANIMALS OF SOME WEST COAST SHELLS.

BY HENRY HEMPHILL.

Trivia solandri Gray. A single living specimen of this beautiful little mollusk recently collected by Miss Ida M. Shepard, at Ballast Point, San Diego Bay, and which she kindly brought to me for examination, enabled me to make the following note on the animal.

When the animal is fully extended, the mantle lobes completely envelop the shell. The lobes are of a brownish flesh-color, thickly though not closely crowded with mammillated tubercles, about thirty-five on each side, flecked and frosted with whitish specks. The tubercles vary some in size and form, the larger ones being rounded and broad at the base, while the smaller ones are narrower and more conical. The nipple-like processes that rise from their summits vary in number from one to four on each tubercle, their tips being also frosted with whitish specks. The spaces between the tubercles are a shade darker than other portions of the mantle, and peppered over with irregular black specks. The edges of the mantle lobes that meet on the summit of the shell are lighter in color than other portions of the mantle, and are also covered with black specks like those between the tubercles.

When the animal is in motion the proboscis extends forward like the bowsprit of a boat; it is about $\frac{1}{2}$ an inch long, a shade or two lighter than the mantles, flecked with whitish specks like those on the tubercles, with its end slightly expanded and edged with white. Two slender tentacles about $\frac{3}{16}$ of an inch long when fully extended protrude from the head near the base of the proboscis, each one bearing a black piercing eye, about midway between their tips and the head of the animal.

The foot is about as broad as the shell, truncated in front and roundly pointed behind, when the animal is in motion. The front of the foot is marked beneath by a very fine transverse dark line, which perhaps serves to define the front edge of the sole. The sole is lighter colored than other portions of the animal that are exposed outside of the shell, and is beautifully and profusely flecked with very small whitish dots.

The animal was slow in its movements, its motion being a contin-

uous glide around the vessel in which it was confined, but most of the time it remained stationary at the edge of the water, as if waiting for the tide to come in, or a chance to escape.

Conus californicus Hinds. The body of this mollusk is whitish in color, and profusely dotted over with black specks that frequently coalesce near the margin of the mantle. When the animal is in motion the foot extends about ¼ of an inch beyond the anterior and posterior ends of the shell. It is truncated in front and bluntly pointed behind. The sole is white and sparsely sprinkled with black specks. The motion of the animal is a constant glide. The proboscis is black, and about ½ an inch long when fully extended, and seems to be a specialized portion of the animal's mantle, rolled together with the lower edges in contact but not joined. It curves over and above the back of the shell, as the animal moves forward. Two small tentacles, of a dark color, each 5 millimeters long, protrude from the head near the base of the proboscis, bearing two small keen eyes, which are situated about half way between the tips and base of the tentacles.

The operculum is horn-color and claw shaped, a portion of the lower or sharp end being free from the animal.

When the animal is in motion this operculum lies transversely across the upper side of the posterior part of the animal's foot.

The nucleus of the young shell is white and glassy, and after a few turns the spire resembles a bluntly pointed, round peg. After this the upper end of the whorls rapidly enlarges, as also does the length of the whorls from the anterior end of the shell to the shoulder.

In the adult the body of the shell is covered with numerous revolving lines, more prominent near the anterior end of the shell.

On the spire of some specimens there are also strong revolving lines, while on others these lines are entirely obsolete. The shoulder of the last whorl is rather concave and forms a shallow subcanal around the shell at the base of the spine, but this, like all other characters of shells, is very variable, and in some individuals it is absent.

The whole shell is covered with a dirty yellowish epidermis that frequently darkens into chestnut color. The shells are quite brittle and very frequently broken, which perhaps is due to the thin, sharp

outer lip, and an excessive amount of carbonate of lime in their composition. The bungling manner in which the animal repairs these fractures does not add to the beauty or attractiveness of the shell, which even in its perfect state is not very inspiring, especially when we consider the beauty of many other cones.

Terebra simplex Cpr. The animal that inhabits this shell is of a pure, pearly white color, without spot or blemish. When fully extended, its foot is about ⅓ the length of the shell. The proboscis is slender, about as long as the foot of the animal, gracefully curved over the back of the shell, and when the animal is in motion it forms an interesting and conspicuous part of the creature, and seems out of all proportions in its length to the rest of the animal's body. This animal has no tentacles, but the eyes are situated on mammillated tubercles that protrude from the body midway between the foot and proboscis. The eyes are small, dark and keen; the foot is truncated in front and rounded behind. The operculum is carneous, unguiculated in form, and lies on the upper side of the posterior part of the foot. This shell is abundant at San Diego and southward.

NOTES ON CALIFORNIAN PLANTS. IV.

BY S. B. PARISH.

VARIATIONS OF CALOCHORTUS VENUSTUS BENTH.

This species, not uncommon in the central region of the State, extends as far south as Elizabeth Lake, in Los Angeles County. Here at its southern limit it is strictly typical; the stem stout and branching and from 18 to 24 inches high; the flowers light lilac, the petals marked above with a reddish stain, below that a brown, yellow-edged occulation, and the basal portion brown-striate; the densely hirsute gland narrowly oblong, and surrounded by scattered hairs. The plants are not very abundant here, but among a considerable number observed not one manifested any noticeable variation.

Hardly fifty miles further north, at Fort Tejon, on the borders of Kern County, they are very plentiful, but here, on the contrary, they show a range of color variation which I have seen in no other plant that has not been subjected to the art of the hybridizer. Specimens growing on the flats about Lake Castac were sufficient to unmistak-

ably fix the species; indeed, they differed only in having the markings less distinct and well defined. But on the precipitous sides of the surrounding grass-clad mountains, where every recess or gentler acclivity was a thickly set bed of these flowers, all the color character of the species vanished. Repeatedly I found it easy to gather from one of these parterres a dozen flowers, each abundantly distinct for a florist's variety, and some of which, if considered by themselves, a botanist might well regard as distinct species. But with all the intermediate variations so profusely present the most diverse extremes were traceable to the original form.

A little study resolved these many-hued varieties into two series, the one of lilacs and the other of yellows. In the former the range of color proceeded from white through varying shades of lilac to a deep purple, the extreme being the var. *purpurascens* Watson. The other series passed through similar gradations from very light yellow to a bright lemon color, which may be identified with the var. *citrinus* Baker.* Sometimes the petals were of uniform color throughout, or were shaded from light to darker tints; in others a lilac petal passed into a yellow border above, or the reverse; others again were yellow striate with lilac, or lilac with yellow. The upper and lower spots of the normal flower were occasionally indicated in these varieties, but in most instances were entirely obsolete.

The glands were uniformly densely hairy, but varied much in size and shape, being oblong, oval, or transversely flattened. In some instances they were obsolescent. All the plants were slenderer stemmed and fewer flowered than in the normal form, single flowered specimens being common, and few exceeded a foot in height. The flowers varied much in size, but were generally smaller than in the type. The whole exhibition appeared to be an example of pure natural variation uninfluenced by hybridization, since no other species was observed in the neighborhood.

Considering how completely all distinctions of color and markings, or of size and shape of gland, here break down, it becomes a question as to what value can be placed on these characters in a group of closely allied species which inhabit the same geographical region.

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*In Dr. Watson's Revision of the N. A. Liliaceæ, and in the Bot. of California this is referred as a variety to *C. luteus*, Dougl., the most natural disposition to make from herbarium specimens. But, considering the associations with which it grows on these hillsides it is evident that Baker was right, if the two species are to be kept up.

It is precisely on such treacherous grounds that *C. luteus* Dougl., *C. venustus* Benth, and *C. splendens* Dougl. were established, and more recently *C. Lyoni* Gray and *C. Plummeræ* Greene have been added to the number. Dr. Watson has already suggested that the first two may be confluent, yet in their typical forms they are the most distinct of the set, the first being yellow and the second lilac purple in color. Yet field observation compels the reference of a yellow variety to the lilac-colored species. The other species above named all belong to the lilac series, differing from each other in the distribution and intensity of the coloration. In this respect typical specimens are sufficiently distinct, but considering the unreliability of this character it is not impossible that further observation may unite them.

LILÆA SUBULATA HBK. A rare plant in the South, and apparently the same elsewhere in the State. The only station known to me is the marshy margin of a shallow pond on the farm of Mr. James Stewart, near Colton Fresh plants show some characters not in entire accordance with the published diagnosis of the species, which was perhaps drawn from dried specimens. Our plant is an annual, the leaves terete, or a little flattened, about six inches long, sheathing at base. Inflorescence axillary, of two forms; an androgynous spike exserted on a peduncle shorter than the leaves, and arising between two sessile ovaries whose filiform styles nearly equal the peduncle. I find no spikes entirely male. The anthers discharge their pollen while the spike is still inclosed in the sheathing bases of the leaves. The radicle fruits mature long before the spicate ones.

GENERAL NOTES OF A TRIP THROUGH SOUTHEASTERN UTAH.

BY ALICE EASTWOOD.

It was my good fortune the past year, towards the end of May, to travel on horseback through a part of the Great American Desert that has been but little explored. The road followed was a cattle highway from Thompson's Springs, a station on the D. & R. G. W. R. R. in Utah, to Moab, a Mormon town on the Grand River; thence to Monticello, another Mormon settlement at the foot of the Blue Mountains; thence down Montezuma Cañon to the San Juan River,

not far from Bluff City, where the gold placer excitement has recently existed; from there, by way of McElmo Creek and Montezuma Valley, to Mancos, a town in southwestern Colorado.

Mr. Alfred Wetherill, who was my guide, planned the route, managed everything about the camp and horses, helped me greatly in collecting, and, altogether, was as good a friend and as efficient an aid as any botanist could desire.

Thompson's Springs is so named because of its relative nearness to water. In a desert country the watering places become the centers, the named places on the map, and though they may be many miles away from a railroad station, yet more than the small cluster of buildings serve to locate to the cattle men, who are almost the only travelers, the general situation of any place. The name would suggest moisture and verdure, but besides the water tank and a feeble stream of yellow alkali water at the bottom of a gulch, everything was dry. However, it was the period when vegetation was most luxuriant, and the earth was gay with flowers. *Townsendia strigosa* almost carpeting the ground in spots, recalled Burns' "wee crimson-tipped flower;" *Thelypodium ambiguum*, with its branching habit, glaucous foliage, and numerous clusters of rose-pink blossoms, gave brightness here and there; while within the precincts of the station were *Aster tanacetifolius*, *Arabis longirostris*, *Abronia micrantha*, *cycloptera* and *turbinata;* a Conanthus differing most noticeably from *Conanthus aretioides* in its smaller flowers, *Œnothera scapoidea* and *trichocalyx*, *Atriplex corrugata* and *Nuttallii*, and the shrubs so frequent in the desert, such as *Grayia polygaloides*, *Artemisia tridentata* and *spinosa*, *Bigelovia graveolens* and *Tetradymia spinosa*. So many of the desert shrubs are spinose, because nature is here such a niggardly provider that their ambitious efforts to become big plants are thwarted, and they must remain straggling, woody, spiny shrubs.

There was no time for exploring the country around Thompson's Springs, nor for branching off onto the alluring mesas and into the side cañons along the road. An early start had to be made so as to reach a spring at noon and Moab at night, allowing plenty of time for collecting on the way.

Some time after we left the station there stretched before us a range of low hills, where the evidences of upheaval were unusually

conspicuous. On each side of a slight depression, which was a rise compared with our starting place, the bands of strata were tipped up slanting towards each other, and plainly matching. It was from this break in the strata that the cañon began, which at first imperceptibly, but later more decidedly, became deeper and deeper, until when we reached the Grand River, the rocky walls seemed to rise perpendicular for a thousand feet at least, and here and there were carved into wonderful and weird outlines by the action of the air and water. The vegetation constantly changed, for we were not only descending, but also passing from the flora of the plain to that of the cañon.

It was a day full of delight; new plants were constantly seen, and some that may be new species were collected. *Lupinus pusillus* was so abundant over large areas that the earth seemed to mirror the sky, while occasionally the rarer *Lupinus Shockleyi* was also seen; *Cleomella plocasperma*, or a nearly allied form, was found growing in a small tract with a most peculiar and new Phacelia. *Eriogonum inflatum* was common over miles of country, and it was noticeable that the amount of swelling at the nodes varied from absolutely none to more than an inch in diameter. The plants destitute of inflation were small and weak, compared with the others, and the question arose as to the cause of the difference. The evolutionist would regard the variation as an illustration and living proof of the formation of a new species, and would look upon the plants without inflation as the original from which the inflated forms arose. The inflation is a feature especially beneficial to a desert, slender-stemmed annual and undoubtedly takes the place of the involucral bracts that most Eriogonums possess. It furnishes the surface essential to the vital functions of the plant during the ripening of the fruit, since the leaves at the root, by which the plant was enabled to raise its stem and spread out its branches, become dried into dust long before the flowers are gone, and often before they are in bloom. It can easily be seen what an advantage the inflated plants have over the others in the struggle for existence, and they show their superiority in greater size and abundance. They even crowd out other plants and almost usurp the soil. New Astragali were continually seen, and were collected in both flower and fruit. *Gilia Gunnisoni*, *Biscutella Wislizeni*, *Coloptera Newberryi* and *Asclepias involucrata* grew on a

sandy bottom, and the Gilia was most abundant and very lovely. In washes, *Encelia nutans* was frequent. Its large head is full of good sense as well as many flowers. When the flowers expand, the head is erect, so that the sun can have its full effect; but when the seeds are nearly ripe, it begins to nod and droops lower and lower until it finally touches the ground and the seeds scramble out so that they may travel far away from their big-rooted mother on the first rush of water that comes down the hills from the heavy rains that sometimes fall. They thus secure a congenial home in a branch wash and do not have to starve on their greedy mother's leavings.

Through the cañon, which we entered in the afternoon, new and attractive plants began to appear. Here and there *Penstemon Eatoni* lifted its showy stems, covered with scarlet drooping trumpets, demanding admiration. *Malvastrum leptophyllum*, with slender, wand-like blossoming stems, was a fine study in harmony of color, the brick red of its flowers toned down by the silvery green of the foliage. *Aster venustus* here has smaller flowers than at Grand Junction, and with violet rays instead of white. *Amelanchier alnifolia* exhibited a new form, more slender and less leafy than the common one, with few flowers, and the leaves glossy on the upper surface. Some plants of *Rhus aromatica* were seen, with entire coarsely crenate leaves. *Fraxinus anomala* and *Quercus Emoryi*(?) sometimes formed thickets. Piñons and cedars grew along the hills, and bunches of rosaceous shrubs, such as Purshia and Cowania were occasionally observed. Cacti were rare, and but one, an Opuntia, with long, slender white spines, probably a form of *O. Missouriensis* was collected or even noted.

Near the Grand River, the space between the cañon walls became wider. It was a sandy bottom, and the wind blew the sharp little bits of quartz and feldspar into our faces in a disagreeable manner. Twilight was impending, but there was still sufficient light to indicate that a flora more peculiar than any seen yet, existed here. In spite of the raging river that must be crossed we resolved to return to this spot in daylight and explore more fully. *Mentzelia multiflora* was the plant most conspicuous in the waning light, and the star-like blossoms opening at our feet seemed to be trying to illumine the way.

The next day's search was cut short by one of those rainstorms

that are called cloud-bursts, where the water descends in sheets and in a short time starts waterfalls that leap a hundred feet in places over precipices, to the slope below, and then rush to the river. Before the storm, however, we secured a Hoffmanseggia that seems to be new, a peculiar form of *Linum rigidum*, *Eriogonum Thomasii*, *Coldenia hispidissima*, *Poliomintha incana*, *Glyptopleura marginata*, *Euphorbia flagellaris*, *Encelia frutescens*, and fine fruiting specimens of *Coloptera Newberryi*. This had before been collected in flower; but it was only now that its puzzling character began to appear. No two seeds were to be seen that looked alike. It was trying to be a Cymopterus and a Leptotænia at the same time, and even its leaves showed the struggles which it was experiencing. Along the river banks were willows, and the common *Baccharis salicina*. *Berberis Fremonti* grew at the foot of the cañon among the rocks, under which we were perfectly sheltered from the storm. *Stephanomeria exigua*, beautiful with its numerous spreading pink blossoms in the early morning, was a bedraggled object after the rain; *Erigeron Utahensis*, just coming into bloom, seemed to be rare; *Brickellia linifolia* in flower along the slopes, and the young shoots of *B. microphylla*, which is a fall-bloomer, were also observed; *Aplopappus Nuttallii*, *Phacelia crenulata* and *Amsonia brevifolia* were there at home too.

Moab is an oasis in a desert, and its poplars might be compared to the palms that made Palmyra so famous for beauty long ago. It is as renowned, too, among the pilgrims through this land, and we had heard of its beauty, its fruits, and its hospitable people before we started. Its green fields, lovely orchards, and extensive vineyards were such a sudden change from the dry country around that, undoubtedly, the impression of its loveliness was made more vivid from the surroundings.

The next day was spent on a barren highway, where whatever green thing could survive the drought fell a prey to the cattle that were driven over that road. The ground was tramped down and marked with the impressions of innumerable hoofs. Towards evening we entered one of the basin-like cañons, called "washes," peculiar to that region. Here was found a Gilia worth thirty-five miles through the dust and heat. It is one of the most beautiful of the genus, and well deserves the name *superba*, which has been bestowed upon it.

The following day was more profitable in the number of plants collected, but as quantity does not always make up for quality, it is doubtful whether it was really more successful. Here and there on the hillsides *Yucca augustifolia* was sending up its flower-stalks; on the mesas which we crossed, a Frasera, taller and more loosely flowered than *F. albomarginata*, was getting ready to bloom; *Berberis Fremonti* became more common along water courses, and was beautiful with the showy yellow flowers amid its holly-like leaves; *Psoralea castorea* spread over sandy slopes. In a small cañon we found the greatest variety seen in one place, and collected *Allium Nevadense?* *Penstemon Parryi*, *Ephedra trifurca* in fruit, a small flowered variety of *Gilia congesta*, an Arabis which is probably a beautiful, rose-colored, large-flowered form of *A. Holbœllii*, found also at Grand Junction, and the widely-distributed *Krynitzkia leucophæa*, the only one of the spicate and glomerate Krynitzkias that can be determined with certainty, because of its smooth, shining nutlets. This cañon led up to a mesa covered with piñons and cedars, and again we were in a region of few flowers, *Penstemon Parryi*, *Gilia congesta*, *and Krynitzkia leucophæa* being almost the only plants under the low trees. We crossed another piñon-covered mesa, after leaving Monticello, and in that little-visited locality found a few plants of *Erodium cicutarim*, the offspring of some daring pioneer. It was a great surprise, and the place at once lost some of its wildness. *Trifolium Plummeræ* seemed common, but was past its period of bloom, and almost of fruit as well.

We were aiming to cut across country, because a cattle highway was so barren, and after great difficulty succeeded in reaching the bottom of Montezuma Cañon, intending to climb up the other side and then ride across an unbroken mesa to McElmo Creek. Montezuma Cañon proved to be a prison from which we could not escape until we reached the San Juan River. Its walls were perpendicular for miles, and impossible to climb with horses. Whenever a hill could be ascended, we toiled up and led our poor animals, only to behold a labyrinth of cañons beyond. However, as we continued to find new plants and were exploring country perhaps as pioneers, we somewhat forgot that our stomachs were empty and our provisions low. *Frasera albomarginata*, *Cymopterus purpureus*, *Calochortus flexuosus*, *Polygala acanthoclada*, *Eriogonum salsuginosus*,

divaricatus, and *glandulosus*, several Astragali, *Gilia pungens*, *Lygodesmia exigua* and *Cnicus Neo-Mexicanus* were among the plants noticed on the rocky hills and cedar-covered mesas. Along the river bottom the grass was high and the trees near the water formed a low grove of box elders, willows and cottonwoods. *Calochortus Nuttallii* was in bloom, and quite common. In general the plants were the same as those usually found not far from water, and as we approached the San Juan River the trees were replaced by *Sarcobatus vermiculatus*, *Bigelovia graveolens*, and *Artemisia tridentata*, so tall as to hide us completely from each other. They all make fine camp fires, but Sarcobatus is the best. We thought that we might also have to try them for internal combustion, but an Indian store on the San Juan River saved us from the attempt.

Along the San Juan River the vegetation was not different from the lowlands of Montezuma Creek; some chenopodiaceous plants were seen, but too young for determination, though as *Grayia Brandegei* was known to grow in that vicinity, all were closely examined and found to be young Atriplices, probably *argentea* and *Nuttallii*. Thickets of *Forestiera Neo-Mexicana* were here and there, and *Lycium pallidum* occasionally replaced the usual desert shrubs. The looked-for Grayia was not found until the McElmo Creek was reached, where many other interesting plants now appeared. *Datura meteloides* was rather startling. It is not supposed to grow so far north, but here it was abundant in the dry bed of the creek and occasionally along the sides. The seed pods are often found in the ruins of the ancient people who once filled this land and guarded every spring with towers of stone. The hackberry, *Celtis occidentalis*, was a new and uncommon shrub; but the other shrubs were those found throughout the whole region. *Œnothera Hartwegi* var. *lavandulæfolia*, was noticeable occasionally, and a few more new Astragali were found, as well as some other plants previously collected, such as Biscutella and *Calochortus flexuosus*. In Montezuma Valley the shrubs were in full bloom, and the hillsides were beautiful with *Peraphyllum ramosissimum*, *Fendlera rupicola* and *Amelanchier alnifolia*. A single plant of the Grand Junction *Chænactis scaposa* was collected, which extends its range two or three hundred miles, the extent of country through which we had ridden during our ten days' trip.

The region traversed belongs mainly to what Dr. C. Hart Merriam

has designated as Upper Sonoran. No mountain species were seen, and but few of those common everywhere along water courses. Animal life was scarce; rarely was even a rabbit noticed or the song of a bird heard.

The careful studies of the plants collected and the list of those noted and collected will form the subject of a paper to which this is an introduction.

GENERAL BIRD NOTES.

EDITED BY WALTER E. BRYANT.

A TRAGEDY IN BIRD LIFE.

One stormy day in December found me on Damon's Point, at the north entrance of Gray's Harbor. A great gale was blowing and the rain and spray were driving in from the sea in clouds. Gun in hand, I strolled toward the beach to view the surf, which was running very high.

A broad, sandy bay made in from the harbor, the upper end of which terminated in a shallow slough about eighteen inches deep. I waded across and was proceeding toward the beach, when my attention was attracted by a small buffle-head duck (*Charitonetta albeola*) commonly called butter-ball. He was swimming around in the slough and obtaining his food in the way common to his kind, by diving and picking up that which came his way. With an admiring glance at his beautiful plumage I was about to pass on, when one of those pirates of the air, a duck hawk (*Falco peregrinus anatum*) came in sight.

Without hesitating an instant, he made straight for my little friend and swooped at him. His long talons came down with a clutch, but they closed on nothing, for the duck was under the water. Undaunted the hawk hovered overhead, and as the water was clear and shallow, he could follow every movement of his prey. Again the duck came up; the hawk swooped to seize him, each move being repeated in quick succession and each dive becoming shorter and shorter.

It was evident that the poor little hunted creature was getting desperate, for the next move he made was to come out of the water flying. The hawk promptly gave chase. There was some clever

dodging in the air, but the duck, frightened and tired, soon saw that his swift pursuer was getting the best of it, so he closed his wings tight against his body and dropped like a stone into the water and plunged out of sight.

Now comes the beginning of the end. While he was under water he either saw the hawk hovering over him or else he became bewildered, for he came again out of the water flying. Like lightning the hawk struck; there was a muffled "squawk," and the tragedy was ended. SAM. HUBBARD, JR.

PUGNACIOUS FLICKERS.

The following facts were related to me by my brother. And there is a fine skin of one of the birds in my collection.

One day he heard a commotion in the loft of the barn, and, thinking that perhaps the cat had caught a bird, he ascended to discover the cause. In the eaves of the barn was a hole made by woodpeckers. Fighting vigorously through this hole were a couple of flickers (*Colaptes cafer*). The birds made such a din that they did not notice his approach and he easily took the inside one in his hand. The bird on the outside, probably thinking that it had vanquished its enemy, promptly entered in pursuit and was in its turn taken in the other hand.

How blind must have been their rage, and how perfectly oblivious of their own end they must have been, for, although still in the hands of their captor, upon being brought together, they would immediately resume the combat, fighting with bill and claws as though their fate depended upon the result.

It would have been interesting to have discovered the cause of the dispute. Perhaps the explanation may be found in the fact that both the contestants were females, and it may have been the outcome of a fit of jealousy. EDWARD C. MERWIN.

THE MOCKING BIRD AT REDWOOD CITY, CALIFORNIA.

In regard to the occurrence of the mocking bird (*Mimus polyglottos*) in this vicinity, I would say that the specimen which I now have in my collection was taken here in Redwood City, September 5, 1891. It was hopping about the ground in search of food, and, although exceedingly watchful, could not be called shy, as it ap-

proached within forty feet of me before I saw it. They are rarely seen here; I have met with but three others during the past twenty-five years. Two of them were shot years ago before I knew anything about preserving the skins; the other was seen in 1880 near my home, but was too wary to be collected. They seem to prefer the company of blue jays (*Aphelocoma californica*), as the last three specimens were with large scattering flocks of these birds and apparently flying about the country with them in search of food.

CHASE LITTLEJOHN.

SECOND OCCURRENCE OF THE FOX SPARROW IN CALIFORNIA.

In San Diego County, January 3, 1888, Mr. C. M. Ingersoll collected a specimen of the fox sparrow in no respects different from Eastern examples. (See Proc. Cal. Acad. Sci. Ser. 2, ii, 90.) Another specimen has been obtained in Oakland, by Mr. W. H. Hall, who writes: "The bird was brought to me December 2, 1892, having been found in the city directly under a telegraph wire, and was still warm." W. E. BRYANT.

NESTING OF THE FLORIDA GALLINULE (*Galinula galeata*) NEAR LOS ANGELES, CAL.

I now have a set of nine eggs of this bird: they were collected west of the city, just outside of the city limits, by William Berman, April 27, 1890. Nest was composed of tule, situated in a bunch of tule in a creek. One or two other sets were obtained at the same time and place. A bird was shot and identified by L. Zellner, of this city.

M. L. WICKS, JR.

OCCURRENCE OF CLANGULA HYEMALIS IN CALIFORNIA.

Mr. W. H. Hall has brought to me for identification a female specimen of the old-squaw (*C. hyemalis*), which was shot at Point Reyes, north of San Francisco, about January 17, 1893, by Mr H. Weiss. In the Proceedings of the California Academy of Sciences (2d. Ser., ii, p. 88) Mr. T. S. Palmer recorded a male specimen from Humboldt Bay. While of rare occurrence in this State, it may be considered a casual winter visitant. W. E. BRYANT.

RECENT LITERATURE.

The Occurrence of Cooper's Lemming Mouse (*Synaptomys cooperi*) *in the Atlantic States.* By DR. C. HART MERRIAM. Proc. Biol. Soc. Wash. VII, 175–177. Notices cf the capture of additional specimens of this species, rare in collections, Baird's type of which the author supposes came from New York State, possibly from New Jersey.

The American Naturalist, January, 1893: "A new Synaptomys from New Jersey," by Samuel N. Rhodes. This new species is named *Synaptomys stonei.* "A new Evotomys from Southern New Jersey," by Witmer Stone. This new subspecies is named *Evotomys gapperi rhoadsii.*

The January number of *The Auk* has two half-tone plates, illustrating an article by Charles Slover Allen, on "The Nesting of the Black Duck on Plum Island." One represents a nest in a thicket, the other a group of black ducks, two adult birds with young, from the representation so successfully executed by Mr. Richardson for the American Museum. "Notes on Certain Washington and British Columbia Birds," by Samuel N. Rhoads. A preliminary paper with a list of additions and critical notes on the status of *Corvus americanus*, *C. caurinus*, *Melospiza lincolni striata*, which is considered "less entitled to recognition than certain subspecies once included, but now stricken from the check list." One of these "stricken" forms is *Vireo gilvus swainsonii*, for which evidence is offered for its re-instatement. *Sylvania pusilla pileolata* is considered a very weak subspecies. One new subspecies is described from the central Rocky Mountains of British Columbia, *Parus hudsonicus columbianus*, Columbian Chickadee, of which the A. O. U. committee will take cognizance. "Description of a New Junco from California," by Leverett M. Loomis, *Junco pinosus*, Point Pinos Junco, from near Monterey. The fifth supplement to the check-list of North American birds, which appears in this number, contains important additions and changes. The sparrow hawk of California becomes *Falco sparverius deserticolus* Mearns, Desert Sparrow Hawk. *Vireo vicinior californicus* Stephens was "considered as not entitled to recognition." Mr. T. S. Palmer proposes *Heleodytes* Cabanis for *Campylor hynchus* Spix antedated by *Campylirhynchus* Mergele, a genus of coleoptera.

Gordiodrilus is the name of a new genus of Oligochæta provisionally placed in the family of Ocnerodrilidæ by its describer, F. E. Beddard (Ann. and Mag. Nat. Hist., ser. 6, Vol. x, No. 55). The genus comes near the American genus Ocnerodrilus, which later reaches its greatest development, as far as is known, on the Pacific Coast. Gordiodrilus differs from Ocnerodrilus in having only one œsophageal diverticulum in somite ix, Ocnerodrilus having this organ paired. The male or spermduct, which in Ocnerodrilus opens in somite xvii, always in the same pore as a prostate, opens in Gordiodrilus in somite xviii, always in a different pore from the prostate, but in the same somite as that organ. Beddard describes five species of Gordiodrilus from Africa and the West Indies. The memoir is very interesting to Pacific Coast investigators, as the new genus forms a connecting link between Ocnerodrilus and the higher terrestrial Oligochæta. Here may be incidentally mentioned that a new genus not yet described, recently found in Baja California, is in many respects intermediate between Ocnerodrilus and Gordiodrilus, having one pair of diverticula in somite ix, originating in the anterior part of the somite. The spermduct opens in somites xviii and xvii, the posterior one independently of the prostates, one pair of which open in somite xvii and one in xix. G. E.

"Expedition a la gruta de Cacahuamilpa." Under this heading we find a memoir of twenty pages, describing the results of a collecting expedition to a cave called "Cacahuamilpa," somewhere in Mexico; the exact locality is not given ("El Estudio," Tom IV, No. 8, Mexico, Sept., 1892).

The memoir is accompanied by two plates containing forty-five drawings of animals, described as new in a most singular manner. There are eleven species pretended to be new, ranging in almost as many different families, from Coleoptera to mollusks and mammals, and all are given as specific name "cacahuamilpensis." Many species are given a new name, probably in order that all may be uniformly "cacahuamilpensis," though the old and first name is sometimes kindly appended. The descriptions are such that not a single species can be identified, not even as to genus, and the figures are in the style of those seen in our daily newspapers.

It would have been much better to distribute the collections to specialists than to disgrace the zoölogical literature in this way.

Unhappily we are promised a continuation, which, if in a similar style as the first part, will no doubt cause the author to become a great light among the natives, but which must nevertheless be considered at a par with similar attempts one hundred and fifty years ago. How many of these "cacahuamilpensis" are really cave-species probably no one will ever be able to tell. G. E.

Description of a new sucker (*Pantosteus jordani*), from the Upper Missouri Basin. By Barton W. Evermann. Extract from Bull, U. S. Fish Commission for 1892. The name is in compliment to Prof. Jordan of Stanford University. The material was collected in the streams of Montana and South Dakota. The author recognizes four species besides the new one, and gives their synonomy and distribution.

Flora Peoriana, by FREDERICK BRENDEL. This paper catalogues the plants within a radius of ten or twelve miles. The vascular plants number 835 species. The paper is replete with interesting data not usually found in such catalogues. K. B.

Development of the Frond of Champia parvula, Harv. *from the Carpospore*, with one double plate. By BRADLEY MOORE DAVIS. Extract from Annals of Botany, No. xxiv. This interesting addition to our knowledge of *Champia parvula* is one of the first fruits of the Stanford University course in botany. Mr. Davis was in charge of the summer course of botany at the Hopkins Seaside Laboratory last year, and is now following a postgraduate botanical course at Harvard University. We hope to welcome him again to the Pacific Coast next year. K. B.

Additions to the Flora of the Cape Region of Baja California (Ext. from Proc. Cal. Acad. sec. 2, Vol. iii), by T. S. BRANDEGEE. In this paper Mr. Brandegee adds 59 species, Nos. 681–739, to the known flora of the region. Notes of interest concerning some previously listed species are given and the following new species proposed: *Dalea trochilina*, *Acacia Californica*, *Albizzia occidentalis*, *Dianthera incerta*. K. B.

Erythæa, a journal of botany, West American and general, edited by Willis L. Jepson, a pupil of Prof. Edward L. Greene. The new journal is to be a monthly of about twenty-five pages apparently.

The contributors to the first number are Prof. E. L. Greene, two papers; Willis L. Jepson, two papers; F. T. Bioletti, descriptions of two new plants. Teratological notes (reversion of the flowers of *Leptosyne maritima* and *Tropæolum minus*) by Marshall A. Howe. Reviews and criticisms, miscellaneous notes and news. The inside of the cover is apparently modeled after some of Rafinesque's publications, containing an advertisement of the journal within the first cover, and a list of the "principal botanical writings" of Professor Greene inside the back

The motto of the journal might fitly be the following paragraph from the introduction to Rafinesque's "Neobotanon," Part 4: "As I think that I am gifted with a peculiar sharp sagacity in discriminating Genera and Species of Plants and Animals, it behooves me to use it in order to rectify these objects and the sciences relating thereto.—It is what I have often done, am now doing and will continue to do as long as I live, not being prevented by the sneer or neglect of anyone whom I consider less sagacious than myself, who cannot discriminate between the most conspicuous characters blended by the Linneists or modern Blenders and Shufflers."

Mr. Greene starts out by alluding to his "reasons for accepting the Cichoriaceæ as a separate natural order, forgetting, perhaps, his experience in describing "*Prenanthes stricta*," and makes declaration that "for the nomenclature of genera we are not disposed to recognize any particular initial date." The usual contributions to the synonymy of Western botany to be expected in a publication over which Mr. Greene has control, follow. *Pulsatilla multiceps* may be, from its very imperfect description, almost anything. *P. Micheneri*, appears from the character to be a rather more glabrous form of *P. Bolanderi*, that species having cuneate-obcordate petals and 10 dilated filaments, the alternate ones shorter.

Mr. Greene has of course a perfect right, if so inclined, to reduce *Potentilla Breweri* to *P. Plattensis*, but why not call it var. *Breweri* instead of var. *leucophylla*, more especially as *leucophylla* has been used in the genus already several times. *Potentilla ambigens* and *P. scopulorum* are perhaps of that genus, though experience has shown that it is not always safe to assume even that degree of accuracy on the author's part, and there is hardly anything in the descriptions to prove that he is not describing forms of, *Barbarea vul-*

garis, for instance. No information is "vouchsafed" as to whether the plants are annual, biennial, or perennial; both species are said to have "about 5 pairs of leaflets," but whether scattered on long petioles or crowded near the top of them is left to the imagination along with such unconsidered trifles as stipules, bractlets, petals, stamens, styles, akenes, etc. Absolutely the only mention made of the floral organs is "flowers small, yellow," in one case, and corollas nearly an inch in diameter, pale yellow," in the other!

Sanicula nemoralis is, as Mr. Greene remarks, the yellow-flowered form of *S. bipinnatifida*. *Sanicula saxatilis* has been collected at Tehachapi, and is probably not uncommon about rocky summits. It has heretofore been considered a form of *S. tuberosa*. *Sanicula septentrionalis*, described from an immature fragmentary specimen distributed under the name *S. Nevadensis* may easily be that species. Mr. Greene's idea of the great importance of the outline, or degree of dissection of a dissected leaf will scarcely commend itself to botanists who know anything about Umbelliferæ. *Microseris indivisa* is a well-known form of *M. aphantocarpha*. *Senecio Blochmanæ* is of course the entire-leaved form of *S. Douglasii*, already provided with synonyms to spare. *Peucedanum robustum* was sent from the type locality to Coulter & Rose at the time of their revision of the Umbelliferæ. They did not find it to be a new species.

Mr. Jepson's account of the mountain region of Clear Lake is remarkable chiefly for the things he did not observe. All the plants mentioned by him have been in the herbarium of the California Academy of Sciences for nearly ten years. *Streptanthus hesperidis* is *S. Breweri* pure and simple. *Arctostaphylos elegans* is another of the absolutely inexcusable synonyms with which that long-suffering genus is becoming loaded. *Gnaphalium bicolor* is so imperfectly described that even the section to which it belongs can only be conjectured from the remark that it can readily be distinguished from *G. leucocephalum*. It is probably only a rather broader-leaved form of that species which belongs to the division "leaves obviously adnate-decurrent, the upper face at least becoming naked and green in age, and with the stem glandular-pubescent or glandular viscid; herbage strongly balsamic-scented; root lignescent-perennial."

Apparently the best species, and certainly the best described is *Collinsia Franciscana;* but the description would have been much

improved if the author had given us some idea of the curvature of the throat, the presence or absence of crests and some indication of the shape of the seeds. As these points are usually attended to in descriptions of Collinsia, their lack leaves few data for comparison. In all species where account is made of the seeds, the ovules should be numbered instead, as they are usually much less variable. It is probably identical with Dr. Kellogg's *C. solitaria*, which was described from the vicinity of Oakland. No type specimen has been found, but the description so far as it goes agrees with the San Francisco plant. The original *C. sparsiflora* was however a coast plant collected a short distance above San Francisco, and before attempting to separate species from it, it would be well to examine the type which is only too likely to be the same as *C. Franciscana*.

In "Notes and News" Mr. Greene takes occasion to sneer at a paper by Professor Coulter and Mr. E. M. Fisher in the November number of the *Botanical Gazette*, on account of the personal names bestowed on the new species. It must be admitted that such names are not in the best taste, but the remarks thereon come with poor grace from the author of *Madia Rammii*, *Clevelandia Beldingii*, *Potentilla Micheneri*, *Streptanthus Biolettii*, *Bæria Burkei Convolvulus Binghamiæ*, *Collomia Rawsoniana*, etc., etc. Perhaps, however, the creator of these names salves his conscience by remembering that they are principally synonyms. K. B.

Contributions from the Botanical Laboratory of the University of Pennsylvania. Vol. i, No. 1. Unlike the usual contributions from botanical laboratories, the papers contained in this are largely physiological. They are: A monstrous specimen of *Rudbeckia hirta*, by J. T. Rothrock; Contributions to the history of *Dionæa muscipula*, by J. M. MacFarlane; An abnormal development of the inflorescence of Dionæa, by John W. Harshberger; Mangrove tannin, by H. Trimble; Observations on *Epigæa repens*, by W. P. Wilson; A nascent variety of *Brunella vulgaris*, by J. T. Rothrock; Preliminary observations on movements of the leaves of *Melilotus alba* and other plants, by W. P. Wilson. The volume is enriched with twelve plates.

Contributions to the Life Histories of Plants. No. 8. By THOMAS MEEHAN. Extract from Proc. Philadelphia Academy, 1892.

This is another of the interesting papers recording observations, principally on the fertilization of flowers, of which several previous

ones have treated. The plants discussed are *Euphrasia officinalis*; Gaura and Œnothera: the carpellary structure of Nymphæa; the sexual characters of Rhus; *Rubus Chamæmorus*, *Dalibarda repens*; some morphological distinctions in the genera of Ericaceæ; vitality of seeds in *Lysimachia atropurpurea; Campanula rotundifolia; Cornus Canadensis; Aralia hispida; Luzula, campestris, Cakile Americana, Hypericum ellipticum, Trifolium hybridum; Lathyrus maritimus; Lonicera cærulea; Raphanus sativus;* the nature of the verrucæ in some Convolvulaceæ; *Polygonum cilinode; Aster Tatarica.* The observations are of a kind to be readily made by anyone with leisure and access at all hours to living plants, and require no great knowledge of systematic botany, yet they are of great general interest, and more attention to the physiology of plants would attract to their study many now deterred by the somewhat dry details of herbarium work.

List of Plants of Los Angeles County, California. By ANSTRUTHER DAVIDSON, M. D. Local lists are always useful even if very incomplete—they stimulate search. The next issue will probably contain a much larger number. There are many in the herbarium of the California Academy of Sciences, from Los Angeles County, not mentioned in this. In Oxytheca, for instance, *O. trilobata* grows at Ravina, and *O. lutea* at Lancaster. *Boisduvalia cleistogama* is probably an error of determination. The rather numerous printer's errors will of course be rectified in subsequent editions.

Flora Washingtoniensis. By W. N. SUKSDORF, is a list of the flowering plants and ferns of the State of Washington. These lists are of great service in the study of the distribution of plants. Washington is a highly objectionable name for a State, as it requires always an explanatory phrase to distinguish it from the better-known seat of the general government.

Contributions from U. S. National Herbarium. Vol. i, No. vi. i. List of plants collected by C. S. Sheldon and M. A. Carleton in the Indian Territory in 1891. By J. M. Holzinger. ii. Observations on the native plants of Oklahoma Territory and adjacent districts. By M. A. Carleton. Two new species *Ipomæa Carletoni* Holz and *Euphorbia strictior* Holz are described, with plates, and *Euphorbia polyphylla* Engelm is characterized. Many interesting observations on the relationship of allied species and the distribution of plants are scattered through the papers.

Check List of the Plants of Kansas. By BERNARD B. SMYTH. Aug., 1892. This is an attempt to give a complete list of the plants of the State with approximate localities. The introduction shows an originality not common in catalogue makers. The author says: "As to nomenclature the compiler simply adopts those names said by common authority to be the correct ones. He is opposed to changes of name in a plant, and prefers a name long-established and well-known to a name which though more correct, is comparatively unknown. Notwithstanding this, exceptions are made, where evidence is indisputable as to priority of some other name as applied to a particular plant. Most noticeable among these is Hicoria instead of Carya, Navarretia for Gilia, Castalia for Nymphæa, and others. . . . Where no name is given the compiler doesn't know who is authority. . . . A few radical changes are made, as the transferring of the order Nymphæaceæ from Exogens to Endogens, these plants showing most clearly endogenous characteristics of structure. Conversely the order Smilacaceæ should be transferred to Exogens, these plants being exogenous when more than herbaceous."

Under the head of "New Species" are included *Erythronium mesochoreum* Knerr, n. sp.; *Cyperus carruthii* Wood, n sp ; *Cyperus spiculatus* Wood, n. sp.; *Setaria perennis* Hall, n. sp. *Sporobolus pilosus* Vasey n. sp.; *Barbula henrici* E. A. Rau, n. sp. All of these "new species," excepting two, are credited at the end of the character to previous places of publication.

PROCEEDINGS OF SOCIETIES.

CALIFORNIA ACADEMY OF SCIENCES, *November 7, 1892.* President Harkness in the chair.

Donations to the museum were reported from John Carlsen, Gustav Eisen, Carl Precht, Dr. J. G. Cooper, John L. Howard.

November 21, 1892. Mr. T. H. Hittell in the chair.

Donations to the museum were received from Willard M. Wood, Miss Lottie Rau, George H. Knight, Sam Hubbard Jr., Overend G. Rose, M. H. Gilson, T. S. Brandegee.

The Librarian reported 104 additions to the library.

Mr. H. W. L. Couperus read a paper on the possibility of the cultivation of coffee within the limits of the United States.

December 5, 1892. President Harkness in the chair.

Additions to the museum were reported from Walter H. Levy, Gustav Eisen, William Hooper, W. G. Blunt, John P. West, Compañia Minera y Beneficiadora de la Barranca, Sonora, Mexico.

The Librarian reported eighty-four additions to the library.

A resolution was adopted to the effect that the Academy heartily indorses the proposition to secure an appropriation from the State Legislature that will cover the annual expense of $25,000 to secure a topographical map of the State, the general government consenting to coöperate with the State to the extent of superintending the work, and appropriating a like amount annually.

December 19, 1892. President Harkness in the chair.

Additions to museum were reported from Herbert Kellogg, Walter H. Levy, W. E. Steadman, Baron Bœselager, Walter E. Bryant, G. E. Colwell.

Eighty-three additions to the library were reported.

The Nominating Committee presented a report embodying a ticket to be voted at the annual election.

January 3, 1893. Annual meeting. President Harkness in the chair.

Additions to the museum were reported from Ed Garner, P. F. Rountree, Dr. Julius Rosenstirn, Wm. F. Nolte, Charles Allison.

The annual reports of the officers and curators were read and ordered filed.

The report of the officers of election was read and the following were declared elected for the ensuing term:

President—H. W. Harkness.

First Vice President—H. H. Behr.

Second Vice President—J. G. Cooper.

Corresponding Secretary—T. S. Brandegee.

Recording Secretary—J. R. Scupham.

Treasurer—L. H. Foote.

Librarian—Carlos Troyer.

Director of Museum—J. Z. Davis.

Trustees—W. C. Burnett, C. F. Crocker, D. E. Hayes, E. J. Molera, George C. Perkins, Adolph Sutro, John Taylor.

January 16, 1893. President Harkness in the chair.

Additions to the museum were reported from Charles Allison, W. G. Blunt, Chase Littlejohn, Charles Fuchs.

Mr. W. L. Watts read a paper on the Geological Economics of the Central Valley of California.

CALIFORNIA BOTANICAL CLUB. *November 23, 1892.* Mr. J. M. Hutchings in the chair.

The following were elected to membership: Samuel H. Hammond, Sidney S. Peixotto, Mrs. A. E. Bush, L. C. Cummins, Miss Mary C. Day, Prof. John Dickinson.

Dr. Gustav Eisen read a paper on the figs of Sonora and Lower California.

CALIFORNIA ZOOLOGICAL CLUB. *December 10, 1892.* Vice President Walter E. Bryant in the chair.

The following were elected to membership: Wm. F. Greany, Dr. H. N. Miner, Fred A. Seavey, W. P. Steinbeck, Aurelius Todd, Prof. C. H. Tyler Townsend, F. S. Plimptom, Dr. Clark, J. Burnham, Overend G. Rose, Mrs. E. S. Alexander.

Mr. Walter E. Bryant read a paper on the zoölogy of Baja California.

Mr. Charles A. Keeler called attention to some of the peculiarities of the fauna of Lower California as illustrating certain laws of evolution.

MISCELLANY.

THE INVESTIGATIONS OF THE COLLECTIONS OF THE EXPEDITION TO BAJA CALIFORNIA.

The California Academy of Sciences of San Francisco has at various times, during the last five or six years, sent small expeditions to the peninsula of Baja California, for the purpose of exploring and collecting natural history specimens of the higher as well as of the lower classes. Various parts of that hitherto little-known country have been visited during the different expeditions, and much material has been brought together for future study. The result has been that the fauna of Baja California is becoming better known, presenting many features of great interest. The flora of this country has been already minutely described by T. S. Brandegee, who has added a

large number of species and several new genera to those already known, enabling us now to judge with great certainty as regards the geographical distribution of the plants and their connection and descent from neighboring geographical plant districts. New species will of course after this be added to those already described and enumerated, but they will be comparatively few, and the flora of Baja California can now be said to be very completely and comprehensibly known. Of birds and mammals the collections brought home are large and good, and descriptions of some thirteen new rodents will soon be published by W. E. Bryant. They are mostly the results of his trapping during last year's expedition to the Cape region, or the southern extremity of the peninsula, remarkable for its high mountains, beautiful and luxuriant vegetation, tropical climate and isolated position.

The fresh water fishes collected there are in the hands of Prof. Gilbert, of the Stanford University. The collection of reptiles and batrachians is good and when described will undoubtedly contain much of general interest. A large collection of arachnids from the Cape region, collected during the late expedition, is now in the care of Prof. George Marx, of Washington, the acknowledged authority on American spiders. He designates the collection as valuable and interesting. His paper will be well illustrated. A collection of Colembolas and Thysanuras is being worked up by Prof. Harold Schött, a well-known European specialist, who has already described a number of new Colembolas from Upper California, and who has since received a number of new forms both from Upper and Baja California, all of which are to be embodied in one general paper, on the Colembolas and Thysanuras of the Pacific Coast. Dr. Otto Stoll, of Zurich, whose beautiful work on acarides in the *Biologia Centralo Americana* is generally admired, will describe a small collection of acarides, principally from the Cape region. The collection of diptera from Baja California is not large, but it may be counted upon to contain much of interest. It will be described by C. H. Tyler Townsend, a well-known specialist of this class of insects.

The collection of orthoptera has been forwarded to Lawrence Bruner, and a valuable paper from his hand is expected, though his preliminary opinion on the collection has not yet reached us. The coleoptera were well represented with some 500 species, principally

from the Cape region. They are now in the hands of Dr. Horn, of Philadelphia, who will describe the new forms at an early date.

The land shells, some twenty-two species collected during the late expedition to the Cape region, contain some eight or ten new species, descriptions of which will soon be published by Dr. J. G. Cooper, who has already written upon the subject of Baja California land mollusks. The land and fresh water oligochæta contain a number of new forms, which are being described by Dr. Gustav Eisen, in connection with other Pacific Coast oligochæta. The species found in the Cape region are entirely tropical, and show most relationship with tropical Mexico and Central America.

The fresh water crustaceans, of which many remarkable forms were collected in the clear waters of San Jose River, will be described by Walter Faxon, of Cambridge. G. E.

NOTES ON THE CLIFF DWELLERS.

In Southwestern Colorado and in Arizona there have recently been extensive explorations of the ruins of a people now extinct, but probably related to the Pueblo Indians at present living in Arizona. The relics found in their houses indicate that they were an agricultural people, and to strengthen this belief remains of ancient reservoirs and aqueducts exist on the mesas above. There, too, are ruins of houses and towers which were probably occupied before defense became necessary and the people fled to the cliffs. The mesa ruins have usually become mounds overgrown with vegetation, but the cliff houses, from their sheltered position, are in a good state of preservation.

It may be interesting to record the uses they made of some of the plants of the region as well as the plants which they cultivated that grow there no more.

Corn, squash, and beans were the chief crops; the walnuts now and then discovered were probably brought from further south with the cotton which has been found on the pod, spun into thread, and woven into cloth. Undoubtedly, they had commerce with their own people further south, or with other tribes, for seashells have been found matted in the hair of the dead, salt most carefully preserved in balls, and for their arrow points, stones not found near by.

The most valuable textile plant was *Yucca baccata*, the fruit of

which most likely served as food. The Utes at the present time dry large quantities cut into strips for winter use. The Yucca fiber was separated into threads, which were twisted into strands varying in thickness according to the purpose for which they were designed. The best sandals were made of the fine thread, woven so as to be ornamented with geometrical designs; for the commoner sandals they used coarser twine, while the coarsest ones are of braided rushes. They depended for warmth upon a fabric made of turkey feathers ingeniously woven with Yucca twine. The long feathers were split and twisted around the Yucca thread, which was then loosely woven into a blanket of feathers soft and warm. The dead are often found with this for the first covering. The skins of deer were used, too, but rarely, probably because of the difficulty of securing them with their poor weapons. They either raised turkeys or the wild ones were abundant, since implements such as awls and needles were made of the bones, and turkey bones blackened with fire are common.

The common rush *Phragmites communis* was used to make a coarse matting, not unlike that which is packed around tea-chests, but woven in different designs. This was used as a second covering for the dead. Willow twigs fastened together something like the slats of Venetian blinds formed the outside cover, the coffin of these prehistoric people. The Yucca fiber, in connection with the common Juncus, was used in making baskets finer than any made by Indians of the present day.

The piñons and cedars are thick on the mesas of this country, and the former furnished an edible nut which the cliff dwellers collected for food. The timbers for their houses were chiefly cedar, as shown by the beams that still form the floors of the upper rooms and the supports of balconies. These beams are curious, pointed at the ends and very jagged from the stone axes used to roughly hack them into shape. Coarse grass with stiff stems, *Oryzopsis cuspidata*, was tied into bundles to make brushes, probably for the hair. The wild tobacco, *Nicotiana attenuata* is common near their homes and in the cañons where their houses stand like statues in their rocky niches the wild fruits are more abundant than elsewhere, leading to the belief that to some extent they were cultivated. A. E.

NOTES ON GAME LAWS, ETC.

Notwithstanding the rain and cold weather of this year Mr. W. O. Emerson reports that Anna humming birds have commenced building in the eucalyptus trees near his house.

The earliest record of the nesting of this species near San Francisco was made by Mr. Ingersoll, who found a nest with two far advanced eggs on January 14; the winter was a more open one than the present.

By the first of March half a dozen or more resident species will have commenced nest building, and the small boy will prepare a box of bran to receive the "collection" which he makes annually, and which is annually destroyed by mice or otherwise. Such pernicious collecting should be discouraged by parents, and might profitably receive some attention from the would-be makers of perfect game laws for California.

Some radical changes are contemplated when the next legislative "tinkering of the game laws" takes place. Like most proposed alterations of the kind there are some good and some injurious. To provide an open season in California for elk, antelope, and mountain sheep is to assist in their total extermination in this State; too many are killed in defiance of the law as it is. The fault is not so much with the law as with the lax enforcement and a deplorable lack of respect for game laws by the public.

Elk are not rare in some places in Southwestern Oregon, and the theory that persecution in that State has resulted in an immigration of elk to California is extremely probable, but no one need suppose that they are spared to any great extent after crossing the boundary line. The law stops the marketing of elk, and in some instances deters parties from hunting for them, but not always. It is not many months since a large expedition, thoroughly equipped, left San Francisco for Northern California, and it was no secret that they were prepared for illegal game.

Every little while some one comes forward with schemes of restocking the State with mammals, birds, and fish, without a thought of what the possible results may be from the introduction of exotic species. There can be no question as to the desirability of at some time introducing new game, but that time will be after the na-

tive species are actually protected, and that time will never come until better enforcement and a more wholesome public respect for game laws is secured. W. E. B.

NEWS.

Prof. W. R. Dudley, late of Cornell, has taken the chair of systematic botany at Stanford University. With such men as he and Prof. Douglas H. Campbell in charge of the botanical work of Stanford University, where botany is taught according to modern methods, we may expect to have, in time, a body of resident botanists whose entire stock of botanical knowledge is not confined to the possession of a limited terminology and a large capacity for discovering new species that do not exist.

Miss Alice Eastwood, formerly of Denver, Colo., has succeeded Mrs. Katharine Brandegee as curator of the Herbarium of the California Academy of Sciences, and as acting editor of ZOE.

Mr. Oscar T. Baron has temporarily housed his magnificent collection of butterflies and humming birds in the California Academy of Science building, where he spends much of his time arranging and studying. He contemplates this fall an extended trip to Ecuador and the central Andes for the purpose of collecting butterflies and humming birds, his collections in these lines from South and Central America and Mexico being among the richest known.

Mr. W. Otto Emerson, who has been studying art in Europe for the past two years, has returned to his home in Haywards, Cal.

On the 1st of February Mr. Charles A. Keeler sailed for New York on the ship *Charmer*. His latest contributi n to science, entitled "Evolution of the Colors of North American Land Birds," forming No. iii of the Occasional Papers of the California Academy of Sciences, has been received too late for review in this issue.

Nine new species of Ocnerodrilus have lately been described by Dr. Gustav Eisen in the Proceedings of the California Academy of Sciences (the memoir not yet published). Two of the species are from the Cape region of Baja California, one from Sonora, Mexico, and the others from Guatemala. Dr. Eisen is now describing the Pacific Coast Oligochæta, and will be glad to receive specimens for examination.

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Dr. A. Kellogg

ZOE

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ALICE EASTWOOD. CHARLES A. KEELER. FRANK H. VASLIT.

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1893-4.

SAN FRANCISCO, CALIFORNIA.

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ERRATA.

Page 49, fourteenth line from top, for "tomentosa" read "tomentella."
" 96, thirteenth and fourteenth lines from bottom, for "stricta" read "arvensis."
" 99, fourth line from top, for "tomentulosa" read "leucophylla."
" 154, eighth line from bottom, for "limosa" read "aquatilis."
" 215, twelfth line from bottom, for "pulegioides" read "Pulegium."
" 335 and 336, for "Pinus contorta" read "P. Murrayana."
" 338, twenty-third line, for Negundo "Californica" read "N. Californicum."
" 338, twenty-ninth *dele* Negundo Californicum.

ZOE
A BIOLOGICAL JOURNAL

VOL. IV. APRIL, 1893. No. 1.

DR. ALBERT KELLOGG.

The name of Kellogg is inseparably connected with the botany of California. Coming to this State in 1849, at the age of thirty-five, he lived for nearly forty years in the midst of a rich and varied flora. He published at various times during his residence, several genera, two hundred and fifteen species,* and several named varieties. The lapse of time and better knowledge have left valid less than sixty of these, but considering his isolation, lack of books and herbarium this proportion contrasts very favorably with the work in California of some botanical writers of much greater pretension. During the years 1877–1883 publication by the California Academy of Sciences ceased, and with the exception of a few which appeared in a San Francisco newspaper, the Rural Press, the species described by him thereafter remained in the herbarium of the California Academy of Sciences with the MS. diagnoses. Several of these, as *Eunanus angustatus*, *Sphæralcea fulva*, *Calyptridium nudum*, etc., have been described, either wholly or in part, from the types of Dr. Kellogg's unpublished species, and no mention made of his work.

He was one of a little band of seven who met at 129 Montgomery Street, in the office of L. W. Sloat, one of their number, on the fourth day of April, 1853, to found by the dim light of candles, which they had brought in their pockets, the California Academy of Sciences, now grown to proportions of which they could have hardly dreamed. When he died, March 31, 1887, he had long survived the rest.

* An annotated list of Dr. Kellogg's species is to be found in Bull. Cal. Acad., Vol. 1, pp. 128-151.

To the end of his life he was closely identified with the organization, which he loved with the love of a father. All visitors to the Society in the later years of his lifetime cannot fail to recall his familiar presence at the drawing-table in shirt-sleeves and red-backed vest, or, as in his hours of relaxation, leaning back in his chair with the stem of a cob pipe between his lips. He retained his sight marvelously, making to the last all his studies and drawings with a small hand lens, and finding any aid unnecessary to his reading and writing. His hair was just beginning to change from brown to gray when he died.

His personal character was above reproach; no one ever imputed to him falsehood or unfair dealing. His botanical statements, though sometimes erroneous, were true so far as he was concerned, and always made in good faith, but he was a dreamy, imaginative man, full of poetic fancies, which often in descriptions caused him to dwell unduly upon some point which caught his fancy. His habit of tracing "correspondencies" between the material world and its organisms and the mental states of man, often appeared in his botanical writings. The first description of "Marah," for instance, was followed by a small sermon on the "bitter waters" of affliction, and to the type of *Quercus Morehus* is appended the following note:

> "Abram's Oak named from the circumstance of Abram's first encampment in the oak groves of Moreh, on his journey to Egypt (Egypt in correspondential language signifies Natural Sciences)."

His childlike enthusiasm and unworldliness impressed all who met him. He asked of the world only the means of simplest living. He lived a happy life and died respected. Would there were more like him.

NOTES ON SOME COLORADO PLANTS.

BY ALICE EASTWOOD.

RANUNCULUS ALISMÆFOLIUS Geyer. This is described in Coulter's Manual as having leaves with entire margins. This is misleading; for they are as often dentate with scattered teeth.

RANUNCULUS MACAULEYI Gray. This varies on every mountain range where it has been found. It grows along the edge of

snow banks, and the buds can often be seen under the thin crust of melting snow. The flowers vary from an inch or more in diameter to a half inch or less. In the San Juan Mountains, above Silverton, it is abundant along the edge of snow banks. The leaves are three-toothed at the truncate apex and entire below; the calyx is thickly covered with soft brown wool. Specimens from the Elk Mountains, above Irwin, have the petals usually entire, but occasionally flabelliform, leaves almost orbicular and crenate nearly to the base, the silky wool dense on the calyx. The form from the La Plata Mountains has the calyx either densely or sparingly hirsute; the root leaves oblong-lanceolate; stem leaves not cleft as in the other two forms.

RANUNCULUS GLABERRIMUS Hook. Specimens of this from Mancos have cauline leaves entire as well as deeply 2–3-lobed, akenes plainly hispid. I have found no plants with three large blunt teeth at the apex of the leaves.

DELPHINIUM OCCIDENTALE Watson. This varies greatly. At Steamboat Springs, in Routt County, it is one of the commonest plants; but rarely could two plants be found with flowers colored alike. They ranged from dark blue to white, and the forms between, where the two shades mingled, were mottled and striped, one part colored blue in one flower, white in another, so infinitely varied that to collect all forms was impossible. Usually it is found at subalpine elevations and is dark blue. I have specimens from above Irwin, in the Elk Mountains, in which all parts of the flower have become blue, bract-like petals.

AQUILEGIA ECALCARATA Eastwood. This has been collected in Southwestern Colorado in but one limited locality, about twenty-five miles from Mancos, near the head of Johnston Cañon that forms a branch of the Mancos Cañon. It was abundant under an overarching rock that even late in August was still wet with the alkali water that oozed from it. The plants were growing in the sandy soil, loosely branching and also climbing up the rocky wall, apparently seeking moisture. The few flowers still in bloom were on stems that clung to the rock, but the plants were full of dry seed pods that indicated their earlier abundance. The pubescence is glandular and the flowers pink or white.

Mr. Alfred Wetherill, who discovered it, reports it also from Southeastern Utah in similar situations.

ARGEMONE. There seems to be doubt as to the existence of *Argemone hispida* Gray as a species, and in Colorado, if it has ever previously been collected, it has been merged into *Argemone platyceras* Link & Otto. It is excluded from both Patterson's and Oyster's check lists, but whether included under *A. platyceras* or *A. Mexicana* var. *albiflora* has not been learned. Judging from the specimens of *A. Mexicana* var. *albiflora* now in the herbarium of the California Academy of Sciences, *A. platyceras* is much nearer *A. Mexicana* var. *albiflora* than *A. hispida*. They are alike in the stem and foliage, glabrous and glaucous, except for the spines which are scattered on the stem and on the veins and margins of the leaves. The veins are also outlined with white, immature pods seem the same; the stamens differ slightly, *A. Mexicana* var. *albiflora* having broad filaments abruptly narrowed to the anther; *A. platyceras* with filaments narrower and tapering to the anthers which are longer and narrower than those of *A. Mexicana*. There is some variation in *A. platyceras* in the manner of branching, size of the pods, and number of spines. There are forms that closely resemble *A. corymbosa*, differing chiefly in having larger pods and the leaves longer, with deeper lobes and blunter at the apex.

Argemone hispida Gray. This is distinct from both *A. Mexicana* var. *albiflora* and *A. platyceras*, and shows so little variation that specimens from Colorado and California have no appreciable difference and agree with the original description as given in Gray's Plantæ Fendlerianæ. It differs most noticeably from the other two in the pale green foliage densely covered with short crimped bristles, short spines on the margins and veins of the leaves and very dense on the stems. The pod is densely covered with slender bristles of varying length, instead of the coarse, horn-like spines peculiar to the pod of *A. platyceras*. In growth *A. hispida* is more compact and the flowers are on short peduncles seeming almost sessile. The seeds of *A. platyceras* have a light-colored, prominent rhaphe and the coat honey-combed. *A. hispida* has the less prominent rhaphe of the same color as

the coat, which is less deeply pitted; the seeds are larger. The pods of *A. hispida* are ovate, and when they dehisce the segments are acuminate. In *A. platyceras* the pods are veiny and the segments acute. I have seen no intermediate forms which might connect these two that seem so different.

ERYSIMUM ASPERUM DC. This widely distributed species, as found on the plains, is low and stout, with pods often four inches long, numerous and perpendicular to the stem. The pods are stiff, and, projecting as they do, remind one of the spears of a Macedonian phalanx. The flowers are yellow. The variety at Silverton, in the San Juan Mountains, has the color of the flowers from pale yellow, almost white, to orange on the one hand, and through shades of pink and crimson to purple on the other. These different shades were found in one patch and seemed to indicate that the common yellow form had become mixed with a purple variety. The mountain form is more slender than the prairie plant, and the pods are ascending.

ARABIS HOLBŒLLII Hornem. This is one of the most puzzling of the western Cruciferæ because of its great variety of forms. If there are any plants of *A. Holbœllii* with one row of seeds in each cell, wherein does it differ from *A. canescens*, which also has stellate pubescence and deflexed pods? The division, if *A. canescens* is a good species, should be thus: Pods deflexed or spreading, seeds in one row, *A. canescens;* seeds in two rows, *A. Holbœllii*. If pods containing both one and two rows of seeds are found on the same plant of *A. Holbœllii*, then *A. canescens* ought to be included under *A. Holbœllii*. Including under *A. Holbœllii* all the forms that are perennial and have pods deflexed or spreading, with two rows of seeds in each cell and pubescence generally stellate, the following forms should be described in order to make the species better understood:

1. From Mancos, Colo. Stem simple, stout, tall, thickly clothed at base with white branching hairs, but not stellate, above glabrous and glaucous; radical leaves from spatulate to oblanceolate, sparingly dentate or entire; cauline leaves sagittate-clasping, pedicels spreading upwards and outwards, pods deflexed or horizontal, glabrous; winged seeds, two rows in each cell, petals twice as long as the stamens, erect.

2. From Mancos. Similar to No. 1, but canescent with close stellate pubescence; pedicels strictly deflexed with scattered stellate hairs, pods sparingly hairy along the margins. This was also collected in Navajo Cañon, a branch of Mancos Cañon.

3. From Mancos. Stems slender, several from the root, canescent with close stellate pubescence; radical leaves from spatulate-dentate to oblanceolate, entire; upper part of the stem and pods smooth and glossy, pods on spreading pedicels, two rows of winged seeds in each cell, flowers small.

4. From Mancos. Similar to No. 2, except that the cauline leaves are oblanceolate, sessile at the lower part of the stem, and sagittate above only.

5. From Southeastern Utah. This branches at the root and also above, and is chiefly distinguished by the short spreading pods not more than an inch in length.

6. From Central City, Colo. This branches from near the base with many slender stems, small lanceolate sessile leaves, with scattered bristly hairs on the margins.

ARENARIA FENDLERI Gray. This is found at Grand Junction with short leaves and straw-colored flowers.

SIDALCEA. This is described as having beakless carpels. The two species found in Colorado, *S. candida* and *S. malvæflora*, have carpels decidedly beaked, wrinkled, and veiny.

SPHÆRALCEA RIVULARIS Torr. This has been collected with two well marked forms. The plant seen in the Uncompahgre Cañon, near Ouray, was almost a bush three feet or more tall, with many leafy stems from the root, lower leaves a foot long, slightly lobed and crenate, hispid with stellate bristles, upper stem-leaves with deeper lobes irregularly toothed; flowers nearly two inches in diameter, white and few among the large, broad leaves which thickly clothe the stem.

At Steamboat Springs, in Routt County, Colo., *Sphæralcea rivularis* is abundant on a mountain side not far from the town. This variety branches into many flowering erect stems, leaves not more than three inches long, deeply lobed into acuminate divisions which are sharply dentate or laciniate, the large rose-colored or white flowers are crowded along the almost naked peduncles.

OXALIS CORNICULATA L. var STRICTA. The common form found at Denver is slender, loosely branching upwards, leaves scattered; the alpine variety shows a modification due to environment, and becomes low and almost prostrate, leaves crowded along the short rather stout stems.

PACHYSTINA MYRSINITES Raf. This is described in Coulter's Manual as having green flowers. All that I have seen have purple flowers.

MENTZELIA ALBICAULIS Dougl. There are two varieties of this common species. One is the widely distributed form with slender stems and linear-lanceolate leaves pinnatifid into narrow, linear lobes. The other which I name var. INTEGRIFOLIA is low with short, stout branches, or in more favorable situations becoming a foot high, leaves ovate-lanceolate or even broadly ovate entire or rarely coarsely and remotely dentate, petals not exceeding the stamens, pubescence somewhat viscid as well as barbed. This grows on the adobe desert and blooms almost as soon as it is up. It branches from near the base, and the leaves seem long and crowded on the short stems; but on the older specimens the stems elongate and the leaves are less crowded.

MENTZELIA MULTIFLORA Gray. At Grand Junction this variable species was found growing on a slaty hillside. It branched diffusely from the base and above, making a globular plant like a tumble weed. The stems are white, slender and sinuous; leaves small, about an inch long and pinnately parted into narrow, linear divisions; flowers small, not an inch in diameter, yellow. Along the McElmo Creek the plants have lobed leaves from one to three inches long, stems less numerous, stouter and straighter than the preceding, flowers larger.

MENTZELIA NUDA Torr. & Gray. This varies in the manner of growth and size of the flowers. The Denver form is loosely branched from near the base upwards, and the flowers are large, from one and one-half to two inches in diameter, distinctly pedunculate. The form from Southwestern Colorado has an erect stem simple up to the inflorescence; the branches are usually short with the almost sessile flowers bunched at the ends; flowers about an inch in diameter.

ANGELICA WHEELERI Watson. This is quite common in Colorado, at middle elevations along streams. Specimens have been collected at Crested Butte, Colorado Springs, Chiann Cañon, and at Central City.

APLOPAPPUS SPINULOSUS DC. and A. GRACILIS Gray occur through Southwestern Colorado, and there seem to be intermediate forms connecting the two. *A. spinulosus* is exceedingly variable, and the forms might easily be mistaken for new species in different localities.

ACTINELLA RICHARDSONII Nutt. This was collected by Miss Alida P. Lansing, in South Park, agreeing with the description of the type and different from the form var. *floribunda* common in Colorado. It has a few large heads, and the stems are shorter and stouter, while the variety has a cyme of many small flowers, and leaves in almost filiform divisions.

ACTINELLA GRANDIFLORA Torr. & Gray. This has the involucre from densely white woolly to almost glabrous, heads from one to three inches in diameter, leaves occasionally simple and linear, more frequently few to several lobed. Stems leafy or nearly naked and scape-like.

CNICUS ERIOCEPHALUS Gray. A few plants collected on Mt. Hesperus, of the La Plata Range, in Southwestern Colorado, seem to approach *C. Parryi* so closely that it is uncertain under which species to place the plants. The foliage is nearly glabrous, the involucral bracts have no lacerate fimbriate tips, the woolly hairs on the bracts are not dense, the flowers are light pink and in an erect glomerule.

CNICUS DRUMMONDII Gray var. BIPINNATUS n. var. This is either a variety of *C. Drummondii* or a new species. At present it seems better to consider it in the former light, and give the characters which distinguish it from the type of the species. Stems several from the root, two feet or more high, sparingly tomentose along the stem and the margins of the leaves; leaves divided into many linear lanceolate divisions that are themselves parted into similar lobes of variable length, the lower lobes often as long as the leaflet; the lobes are linear and about one-fourth inch

wide, one to three inches long; heads small and narrowly oblong; lower bracts of the involucre with weak prickles, upper ones purplish, acuminate and tipped with a weak point, scarious; flowers much exserted, heads several at the ends of the leafy, spreading branches.

FRAXINUS ANOMALA Torr. In this queer ash the leaves are nearly always simple and entire, the three-lobed or divided ones being rare. It is found at Grand Junction and on Mesa Verde, in Colorado, and through Southeastern Utah.

PHACELIA SPLENDENS n. sp. Annual, erect, about a foot high, usually simple stemmed, sometimes branching from near the base; stems purplish, glandular or glabrous; leaves ovate-lanceolate in outline, pinnately parted into three or four pairs of alternate divisions that are either crenate or bluntly lobed and oblique at base, nearly glabrous, but glandular on the rhachis; scorpioid cyme with a long naked peduncle; flowers on short pedicels; calyx white-hirsute, and slightly glandular, divisions linear-lanceolate, 1 mm. wide, 4 to 6 mm. long, veiny in age, with longitudinal nerves, slightly surpassing the ripe capsule; corolla bright blue, rarely white, about 1 cm. in diameter, divisions obtuse; stamens and style conspicuously exserted, 7 or 8 mm. beyond the corolla; capsule veiny, glandular, and hirsute; seeds with the central ridge very prominent, cymbiform, favose over the whole surface, but not corrugated. This beautiful Phacelia belongs to the Euphacelia, near. *P. glandulosa* and *P. Neo-Mexicana*. It grows on the adobe desert soil, and while not along the edges of irrigating ditches or washes, it was comparatively near by.

Collected at Grand Junction, May, 1892.

PENTSTEMON MOFFATII n. sp. Stems several from the root from one to two feet high, erect, scabrous below, glandular hirsute above; radical leaves crowded, ovate-spatulate, entire, decurrent along the petioles which equal or surpass the blade in length; lower cauline leaves spatulate with long, broad petioles which are connate-clasping; upper, ovate-lanceolate, closely sessile by a cordate base obscurely dentate at the apex or entire; thyrsus interrupted, the many-flowered clusters about an inch apart;

calyx of linear-lanceolate divisions hirsute, glandular, and ciliate with crimped hairs; corolla purplish blue, hardly bilabiate, spreading lobes orbicular; two of the stamens inserted at the base, the other two half way up the limb, nearly on a line with the sterile filament which is moderately bearded down the side with hairs pointing downwards. In the descriptions of Penstemons no attention has been paid to the insertion of the filaments which may prove of use in determining species that seem closely related. This belongs to the Genuini and is nearest *P. albidus* of which it may prove to be a variety. It differs from *P. albidus* in being less glandular, the shape and attachment of the leaves, the more interrupted inflorescence, the color and shape of the corolla, the denser beard of the sterile filament and in the explanate anthers which in *P. albidus* are orbicular and in *P. Moffatii*, oblong. It was collected at Grand Junction along the railroad to the coal beds, and I have named it in honor of David H. Moffat, ex-President of the D. & R. G. R. R., whose courtesy and kindness I wish to acknowledge.

ABRONIA TURBINATA Watson. This varies in the fruit, the wings in some specimens being well developed; in others, more or less aborted.

ATRIPLEX CORRUGATA Watson. This was collected at Grand Junction, in May, 1892, with both monœcious and diœcious plants. The plants collected the previous season from which the description was made were all diœcious.

ERIOGONUM BREVICAULE Nutt. This is the plant which Nuttall named *E. campanulatum*, but which with *E. micranthum* Nutt. Dr. Gray reduced to *E. brevicaule.* He says that these three species are not permanently distinguishable even as varieties. The descriptions omit the most striking feature of the flower, the urn-shaped perianth, constricted at the throat and angled along the sides. All the flowers examined on the Grand Junction plants have perfect flowers.

ERIOGONUM GLANDULOSUM Nutt. This has been but rarely collected, and the description is imperfect. My specimens agree with Nuttall's description of *Oxytheca glandulosa* under which

name it was first described. The following characteristics not given in Nuttall's description, seem worthy of note: The bracts within the involucre which in Eriogona generally are so small as to be seldom noticed, in this species are larger than the teeth of the involucre, which therefore seems to be double; the capillary branchlets are geniculate about the middle, usually bending towards their axis. It is rare at Grand Junction, but was common on a hill-side in Montezuma Cañon in Southeastern Utah.

ERIOGONUM SALSUGINOSUM Hook. There are two forms of this that are strikingly unlike, but specimens with peculiarities of both are to be found on the same plant. One has the involucre sessile in the axils of the leaves or the forks of the stem and appears close and compact; the other has the heads at the ends of hair-like peduncles of from one to three inches long; the sessile heads are often found as well as the long pedunculate ones on these specimens which usually have narrower leaves than the first form. The pedicels are generally purple and often the whole plant has the same color. Found at Grand Junction and along McElmo Creek, in Colorado. It also grew on rocky, rounded hills in company with *E. glandulosum* and *E. divaricatum*, in Montezuma Cañon, in Southeastern Utah.

ERIOGONUM MICROTHECUM Nutt. The varieties of this species are puzzling, for it seems hard to know where and how to draw the line between it and *E. corymbosum* Benth. The flowers of the two species and their varieties differ so little as to furnish obscure distinguishing marks. The chief marks of difference are in the manner of growth and flowering. It seems best to arrange them in this way until more material can be obtained.

The type and the variety *effusum* have been sufficiently described; but there is a variety on the mesas at Durango, which seems to be undescribed. I propose to name it var. RIGIDUM because of its stiff manner of branching and flowering. Stems woody, one to two feet tall, branching from the base and also above, with erect branches tomentose throughout; leaves narrow, linear, revolute, numerous along the stem, about 2 cm. long;

corymbs umbel-like, small and compact on naked peduncles from 2 to 8 cm. long; the branchlets are usually perpendicular to the axis and the involucres are sessile, perpendicular, erect, and secund on the upper side.

Eriogonum corymbosum Benth. Leaves from narrowly linear 5 mm. wide to oblong 2 cm. wide, crenate-undulate on the margins and densely white-tomentose on the under surface. The leaves are either clustered near the root or are along the stem to the long, naked peduncle of the corymb, which is usually spreading but sometimes almost capitate. The stems, branches, and branchlets are densely tomentose and seem coarse compared with the var. *leptophyllum*. This variety has long, linear-lanceolate leaves with revolute margins, somewhat tomentose below, almost glabrous above, corymbs on naked peduncles, barely surpassing the leaves, loosely branched, sparingly flowered. The species is usually found on slaty hill-sides, while the variety is found in loose soil under the piñons and cedars or along the banks of dry alkali streams. It is uncertain whether the variety belongs to *E. corymbosum* or to *E. microthecum*.

Smilacina stellata Desf. This is described as having blue-black berries. All that have been seen in Colorado, from observations extending over several years, have the berries at first green, striped with red, but when fully ripe they are red all over. The species in California has been collected with the red-striped berries. Doubtless, if collected or observed later in the season, the berries would be found as in Colorado.

Fritillaria atropurpurea Nutt. This was collected at Mancos with both perfect and staminate flowers, showing a tendency to become diœcious. No pistillate flowers were found.

Calochortus Nuttallii Torr & Gray. This usually has white petals, but at Grand Junction it varies through all the shades of pink to crimson-purple and also white. *C. Gunnisoni* shades through the blue shades to the bluish-purple and white.

A NEW TRYPETID FROM CHACALTIANGUIS, MEXICO, WITH A NOTE ON HEXACHÆTA AMABILIS LW.

BY C. H. TYLER TOWNSEND.

The following trypetid was collected by the writer, December 31, 1892, at Chacaltianguis, a river town about seventy-two Mexican miles up the Papaloapam River from Tlacotalpam. It was taken with other diptera and various insects, by sweeping the undergrowth in the edge of the woods back of the town.

This trypetid belongs, by the markings of its wings, in the genus Euaresta. It has four bristles on the scutellum, which does not, however, preclude it from this genus, as some of the species placed here by Loew also possess four scutellar bristles. But the shape of the wings is distinctly different from that of the wings of Euaresta. They are very broad on the median one-half of their length, then slightly taper to a blunt apex. I shall leave the form for the present, however, in Euaresta. The species is very similar to *E. Mexicana* Wd. and *E. melanogastra* Lw. (syn. of preceding ?) but differs from both in having four bristles on the scutellum; and it also differs from all the species of Euaresta in another character which must be mentioned, and which was considered by Loew of generic importance, that of the third longitudinal vein being bristly almost to its termination.

EUARESTA LATIPENNIS nov. sp. ♀.

Front more than one-third width of head posteriorly, evenly narrowed to about one-third width of head at base of antennæ, pale silvery on borders, the rest being taken up with the wide, very dilute tawny frontal vitta, which also has a silvery reflection. Antennæ very dilute tawny, third joint about one and one-half times as long as second, second joint with a small bristle anteriorly and sparsely clothed with minute bristles; arista thickened basally, where it is concolorous with antennæ, and shows a basal joint, blackish on remaining portion. Eyes (in dry specimen) dark green, or dull purple, according to change of light. Frontal bristles five in number on each side, not including the long posteriorly directed pair on vertex; of these the anterior

three on each side are nearly straight and directed forward, while the hinder two are curved and directed backward. A pair of curved, divergent, anteriorly directed ocellar bristles. Face and palpi pale silvery, the palpi sparsely clothed with small bristles on lower portion; cheeks, occiput, and proboscis dilute tawny, occiput above bordered with a row of whitish bristles. Thorax slightly silvery cinereous, with three golden brown vittæ, clothed with whitish bristles and hairs; humeri and pleuræ concolorous; scutellum nearly concolorous, rather triangular in shape, with four bristles, the anterior pair longest, the apical pair hardly decussate. Abdomen brownish, flattened, curved under, somewhat ovate in outline, rather pointed behind, quite sparsely clothed with short bristly hairs, and with longer bristles on hind margins of segments. Legs pale brownish fulvous, claws short and blackish. Wings broad, rather long, from apical three-fourth tapering almost equally on anterior and posterior borders to a blunt apex. Picture of wings almost the same as that of *E. Mexicana*, figured by Loew in Monographs, iii, pl. x, fig. 28. Differs from the figure only as follows: Second vein ends about in middle of margin of hyaline spot third from tip on anterior border; of the three marginal hyaline spots of second posterior cell, the two end ones are somewhat elongated inward like the middle one; the proximal one of the two costal hyaline markings in marginal cell does not extend inward below the second longitudinal vein, or is represented by only the merest dot, and the distal one does not quite reach second vein; one (the right) wing shows two hyaline drops about middle of discal cell, the distal one smaller, while in the other wing the smaller distal drop is represented by two very small dots in a line transverse to the wing; five hyaline drops in third posterior cell, two bordering on posterior margin of wing, two approximated to fifth-vein, and one bordering on the sixth (anal) vein considerably removed from the margin; four obscure hyaline drops in the less infuscated anal angle of the wing, inside the anal or sixth vein; the coloring becomes more or less dissolved toward the wing base, the second basal cell being mostly clouded on distal half. Third vein bristly to a point about opposite or a little beyond termination of second vein, first vein bristly nearly

all of its length. The markings of the wings are nearly black, or brownish black. Halteres pale tawny, knob pale lemon yellow.

Length (with abdomen curved under), hardly 3 mm.; of wing, 3½ mm.

It is quite probable that a separate genus will have to be created for this form, at some future time, based on the shape of the wings, the bristly third vein, and the four bristles of the scutellum.

NOTE ON HEXACHÆTA AMABILIS LW. A single specimen of this most handsomely marked trypetid was taken with the preceding at Chacaltianguis, December 31, on foliage of plants in the edge of the woods. The species of the family Trypetidæ are remarkable for their handsome markings, but this species, while possessing no other colors than black, dilute brown, and two shades of yellow, is one of the most beautifully marked species of this beautifully marked family.

The markings of the wing in this specimen are of a deep shining black. Loew does not mention the hyaline drop in proximal end of distal cell, or leaves it to be implied when he likens the pattern to that of *H. eximia*. According to Macquart's figure of the latter (Dipt. Exot. Sup. 4, pl. 27, fig. 3), and allowing for the modification in Loew's text, I would not call the pattern of *H. amabilis* at all similar to that of *H. eximia*. Loew's description of the wing pattern agrees perfectly in nearly every detail with the present specimen. He described only the ♂. The present specimen is a ♀.

The middle femora in this female specimen are hardly at all black, and the hind femora are only a little black on inside and outside, the rest being all yellow; there are two patches of black on pleuræ below wing bases, these patches being separated by the longitudinal pleural vitta of sulphur yellow, the forward portion of the pleuræ dissolving into brownish fulvous. The head is pure deep lemon yellow, the eyes of a purplish red (in dry specimen); front about two-sevenths width of head, hardly narrowed anteriorly, with three black frontal bristles on each side directed forward and inward, two weaker ones behind on each side directed backward and not inward, and a pair at each

vertical angle with two short pairs between them. Ocellar bristles consisting of one extremely weak pair directed forward. The antennæ, face, front, cheeks, occiput, palpi, and proboscis are all of the pure light yellow; only the labella tinged with fulvous, the arista brownish, the ocellar spot blackish, and the bristles on head black. Claws and pulvilli just a little elongated.

Length, 6 mm.; of wing, 6 mm.

ADDITIONS TO THE FLORA OF COLORADO. II.

BY ALICE EASTWOOD.

1. *Lepidium campestre* R. Br. Rare along the Platte River, near Denver, July, 1892.

2. ARABIS PULCHRA Jones. Grand Junction.

3. *Saponaria officinale* L. Along the railroad, Denver, July, 1892.

4. Malvastrum leptophyllum Gray. Along McElmo Creek, June, 1892.

5. *Malva rotundifolia* L. Introduced at Denver, but not common.

6. *Erodium cicutarium* L'Her. Along the Grand River near the opening of the cañon, Denver. Not common.

7. PSORALEA CASTOREA Watson. Grand Junction on the mesa across the Gunnison River, May, 1892.

8. *Onobrychis sativa* L. Escaped from cultivation near Ridgway, June, 1892.

9. ASTRAGALUS DESPERATUS Jones. Collected at Grand Junction and on the McElmo Creek, Colorado, May and June, 1892.

10. ASTRAGALUS CICADAE Jones n. sp. Collected at Grand Junction along the railroad track that goes to the coal mine, May, 1892.

11. ASTRAGALUS ANISUS Jones n. sp. Collected at Pueblo by Miss Alida P. Lansing in 1892, and by the writer in poor specimens in Southwest Colorado near Mancos in 1890.

12. ASTRAGALUS WETHERILLII Jones n. sp. Collected along the Grand River between Grand Junction and De Beque, May, 1892.

13. ASTRAGALUS LANCEARIUS Gray. Collected at Mancos where it is common, June, 1892.

14. ASTRAGALUS ASCLEPIADOIDES Jones. This remarkable astragalus grows at Grand Junction along the railroad to the coal mine, June, 1892.

15. ASTRAGALUS NUTTALLIANUS, DC. Common at Grand Junction, May, 1892.

16. ASTRAGALUS GRALLATOR Watson. This was incorrectly reported as *A. Grayi* in Additions I, Zoe, ii, 3.

17. ASTRAGALUS AMPHIOXYS Gray. Common at Grand Junction and Durango, May and June.

18. ŒNOTHERA BRACHYCARPA Gray. This was reported as *Œ. triloba* in the article mentioned above.

19. ŒNOTHERA CARDIOPHYLLA Torr. Grand Junction, June, 1892.

20. ŒNOTHERA ALYSSOIDES Hook. & Arn. var. MINUTIFLORA Lindl. Grand Junction on the adobe desert, May, 1892.

21. OPUNTIA WHIPPLEI Eng. & Torr. Durango and Mancos on rocky hills, June, 1892.

22. LIGUSTICUM EASTWOODÆ Rose ined. n.sp. Common above timber line in the La Plata Mountains, August, 1892.

23. PEUCEDANUM AMBIGUUM Nutt. var. LEPTOCARPUM C. & R. This was wrongly reported in Additions I as a variety of *P. nudicaule.*

24. *Scabiosa atropurpurea* L. Escaped from cultivation at Durango, August, 1892.

25. BRICKELLIA BRACHYPHYLLA Gray. Mesa Verde, August, 1892.

26. BIGELOVIA NEVADENSIS Gray. Mesa Verde, August, 1892.

27. TOWNSENDIA STRIGOSA Nutt. Along McElmo Creek, June, 1892.

28. ASTER FRONDOSUS T. & G. Collected in South Park by Miss Alida P. Lansing.

29. *Anthemis Cotula* L. Sparingly introduced at Denver, August, 1892.

30. *Chrysanthemum Leucanthemum* L. Collected at Denver along the Platte, and at Irwin not far from timber line and near a house shattered by an avalanche.

31. SAUSSUREA ALPINA DC. var. LEDEBOURI Gray. This was collected by Miss Alida P. Lansing, near Farnham, Colo. It is much further south than ever before reported.

32. *Cichorium Intybus* L. Introduced from gardens, Denver.

33. *Tragopogon porrifolius*, L. Escaped from cultivation throughout the State.

34. STEPHANOMERIA EXIGUA Nutt. Grand Junction, May, 1892.

35. LYGODESMIA EXIGUA Gray. Grand Junction, May, 1892.

36. AMSONIA ANGUSTIFOLIA Michx. var. TEXANA Gray. Grand Junction on the mesa across the Gunnison River, May, 1892. This is very showy with its many clusters of blue flowers.

37. PHILIBERTIA UNDULATA Gray. Cañon City, along the Hog-Back, June, 1892.

38. KRYNITZKIA PTEROCARYA Gray. This is common at Grand Junction, May, 1892.

39. AMSINCKIA TESSELLATA Gray. Collected at Morrison by Miss Lansing.

40. LYCIUM PALLIDUM Miers. McElmo Creek, June, 1892.

41. *Datura Stramonium* L. At Denver, along the Burlington R. R., near Thirty-first Street.

42. *Linaria vulgaris* Mill. At Durango and in Platte Cañon, near Estabrook, August.

43. PENSTEMON STRICTUS Benth. Durango, July, 1891.

44. MIMULUS RINGENS L. Along the Platte, near Denver, July, 1892.

45. CORDYLANTHUS RAMOSUS Nutt. This was probably reported from Southwest Colorado as *C. Kingii*. It is found at Mancos under cedars and piñons, August, 1892.

46. *Nepeta Cataria* L. Denver, Colorado Springs, 1892.

47. *Brunella vulgaris* L. Common everywhere near water.

48. PLANTAGO PUSILLA Nutt. Grand Junction, May, 1892.

49. *Chenopodium urbicum* L. Evidently introduced. Along a roadside in North Denver, September, 1892.

50. MONOLEPIS PUSILLA Torr. Under sage brush, Grand Junction, May, 1892.

51. *Atriplex roseum*, L. Introduced at Denver. Rare.

52. ERIOGONUM DIVARICATUM Nutt. Grand Junction, May, 1892.

53. ERIOGONUM GLANDULOSUM Nutt. Rare at Grand Junction, May, 1892.

54. ERIOGONUM BREVICAULE Nutt. Grand Junction, May, 1892.

55. RUMEX HYMENOSEPALUS Torr. Grand Junction, May, 1892.

56. ALLIUM NEVADENSE Watson (?) Grand Junction, May, 1892.

57. NOTHOSCORDUM STRIATUM Kunth. Mancos and Grand Junction, May.

58. CALOCHORTUS FLEXUOSUS Watson. Along McElmo Creek, June, 1892.

59. SPARGANIUM EURYCARPUM Engelm. Along the Platte, Denver, September, 1892.

60. SPOROBOLUS CONFUSUS Vasey. Denver, July, 1892.

61. *Dactylis glomerata* L. Denver. Introduced.

62. *Polypogon Monspeliensis* Desf. Denver. Introduced.

63. *Eragrostis major* L. Common at Denver. Introduced.

64. *Poa brevifolia* Muhl. Denver, along a ditch. Introduced.

65. GLYCERIA ACUTIFLORA Torr. Denver.

66. Glyceria fluitans R. Br. Denver.

67. Glyceria pallida Trin. Denver.

68. Glyceria grandis Watson. Denver.

69. Agropyrum glaucum R. & S. var. occidentale V. & S. The Common Blue-Stem. Denver.

70. Agropyrum tenerum Vasey. Denver.

71. *Elymus Virginicus* L. var. *submuticus* Hook. Denver.

RESTRICTED DISTRIBUTION OF FRESH WATER OLIGOCHÆTA.

BY GUSTAV EISEN.

The geographical distribution of fresh water oligochæta, as compared to fresh water algæ, is most interesting and unexpected. It is well known that a majority of species of fresh water algæ are cosmopolitan, and even locally widely distributed, being rarely confined to special localities, such as a single pond, spring, or lake. An alga which is found in one spring or creek is almost certain to be found in some other spring or creek in the vicinity. Many species have a world-wide distribution, while others of rare occurrence have been found in distant localities. With the fresh water oligochæta this manner of occurrence is exactly opposite. Few species are found in countries far apart. Not one species is found distributed all over the world, while by far the greatest number of species are endemic in certain districts, or even confined to certain ponds, lakes, rivers, creeks, or springs outside of which they do not appear to thrive. With the genera this, of course, does not hold good. True, Lumbrici are found the world over, but it is more than probable that whenever the same species is found in very distant countries, it has been artificially introduced there with economic or garden plants brought along by nursery men or horticulturists. The distribution of fresh water oligochæta is as yet only imperfectly known, and it is too early to compile their geographical distribution, but enough is known to warrant us to believe that there are some powerful influences in nature which operate on and curtail their

geographical distribution, which influences are not interfering with the fresh water algæ inhabiting the same localities.

Nearly all the California fresh water oligochæta which have been described to date, have been found in single ponds or springs, and have been vainly searched for elsewhere. Thus in the Mountain Lake, near San Francisco, at the Marine Hospital, several forms occur which are not found outside of that little pond, as a pond it really is. We may mention *Sutroa rostrata* and *Limnodrilus silvani* (long form) among others. In Laguna Puerca, which is only a few miles from this place, we look in vain for these species, but here another species and genus occurs, which again is found nowhere else. This genus is a new one, related to Sparganophilus, of the family *Rhinodrilidæ.* This family is an American one, still one species of Sparganophilus has lately been found and described by Benham, from a very limited spot in the River Thames, in England. Mr. Benham is convinced that the cocoons of this worm have been brought there with American plants, as the locality where the worm is found is, in reality, restricted to a few yards square. *Sutroa rostrata* is similarly restricted, it being only found in a place not over a hundred feet square in the pond mentioned above. But, if we return to our San Francisco species, we find that in Laguna Merced, not over a mile from Laguna Puerca, we look in vain for any of the species found in the two other ponds. *Sutroa alpestris* again has been, so far, only found in a few small springs around Donner Lake, in the Sierra Nevada, and I have not been able to find it elsewhere. *Telmatodrilus vejdovskyi* again has, though extensively searched for, only been found in a single meadow in the Sierra Nevada, in Fresno County. Eclipidrilus is another remarkable form, found in two little springs at Alpine Meadows, on the head waters of the middle-fork of King's River, in the Sierra Nevada.

Ocnerodrilus occidentalis has only been found in a plat of garden one hundred feet square in Fresno County, but nowhere else in California, nor have I been able to find any other species of Ocnerodrilus in this State. *Ocnerodrilus beddardi* occurs only in the Cape region of Baja California, but does not transgress its limits, and does not reach the main-land of Mexico, across the

Gulf of California. In Sonora I found only *Ocnerodrilus sonoræ*. In Central America the species were equally confined. In the vicinity of the City of Guatemala I found four distinct species of Ocnerodrilus, each one of which was confined either to a certain garden or to a certain creek or pond, while in parts of the country other species were found equally restricted. The Enchytræides are almost equally circumscribed geographically. A species of Pachydrilus could only be found in a single little creek (Rush Creek, Fresno County) in the Sierra Nevada, and I searched for it in vain elsewhere, though small creeks abound there everywhere not one mile apart. Another gigantic Enchytræus, several inches long, was confined to a single little meadow on the south fork of King's River. Only one or two of the California limicolids have a wider distribution, and they are species of Limnodrilus, which genus shows a greater adaptability to different localities than any other. With such restricted geographical distribution it is to be expected that many interesting and aberrant oligochæta may yet be found in almost every isolated water course or pond, especially in countries where, through the division of seasons into dry and rainy, the water courses and ponds are comparatively scarce and disconnected.

CONTRIBUTIONS TO WESTERN BOTANY. No. 4.

BY MARCUS E. JONES.

Astragalus candidissimus (Benth.) Wat. Probably from a woody root if not shrubby, rather tall, a foot or two high at least; stems flexuous; peduncles one and one-half times longer than the leaf, rather stout; stipules minute. Mr. Brandegee's specimens from Magdalena Island have about eight pairs of leaflets, obovate-cuneate, rounded or emarginate at apex, scarcely petiolulate, appressed silvery silky, five lines or less long; whole leaf three inches long; petiole an inch or less long; flowers, in dense spikes which are two inches long, five lines long, almost sessile, minute bract twice as long as pedicel; calyx black-hairy, two lines long, cleft deeper on the upper side, teeth short, triangular, one-half the length of the campanulate tube; pods sessile,

membranous, inflated, an inch long when fully developed, minutely pubescent, oval, apparently circular in cross-section, with a short triangular point, very slightly pointed at base, horizontal, dorsal suture scarcely evident, generally sulcate slightly dorsally, ventral suture impressed about a line deep in the middle of the pod and seed-bearing for half the length of the pod, not impressed at base or apex, deeply sulcate ventrally to about one-third the depth of the pod, seeds small, many; young pods more pointed and hoary pubescent.

Other specimens from Scammon's Lagoon, Lower California, have oblanceolate leaflets, six lines long, neither truncate nor acute, twelve to fifteen pairs; no petiole; leaf three to six inches long; calyx, bracts, and spikes the same as above; flowers light purple, sides of banner and tip of keel dark; blade of keel two and one-half lines long, bent from base of blade to the blunt tip into one-third of a circle, very short and thick; broadly lanceolate wings, little ascending and a little longer than keel; banner ovate in outline, large, curved in an arc of a circle beginning at tip of calyx teeth, apex erect, two lines longer than keel; pods inclined to be ovate and more pointed, minutely pubescent, less deeply sulcate, but otherwise the same. The heads resemble *A. adsurgens.* Manifestly allied to *A. diphysus* and *lentiginosus*, despite the one-celled pod, but nearest to *A. oocarpus.* The whole section to which this belongs, from *A. curtipes* to *A. Douglasii*, is in great need of careful and extensive field studies. I have no doubt that there are twice as many species recognized as exist. This might be *A. vestitus* as far as the description goes, for some of the flowers might be called ochroleucous if taken alone.

Astragalus anemophilus Greene. (Includes *A. Miguelensis* Greene.) This is very closely related to *A. candidissimus*, and may prove to be identical with it, and is quite likely to be *A. vestitus.* It differs from the former so far as the type goes in the stipules being connate opposite the petioles, and in the white-woolly pubescence. The flowers are too immature to determine what they are. The pubescence of *A. candidissimus* is woolly or tangled on the calyx, but elsewhere is of straight or slightly tangled hairs which are appressed. The leaflets of this species

are in ten to fourteen pairs, oval to elliptical, truncate to acutish, and sometimes apiculate, four lines long; petiole an inch long or none; flowers in a short and rather loose spike; pods hoary to almost glabrous; calyx two lines long, campanulate, teeth triangular and very short; pods the same as in *A. candidissimus*, also the pedicels, bracts, and peduncles. This is probably woody at base. The calyx is cleft deeper above, little gibbous, teeth nearly equal; flowers ochroleucous and ascending. Described from the type in the California Academy. Collected by E. L. Greene at Cape San Quentin, May 10, 1885. So far as the description goes, this also might be *A. vestitus*.

Astragalus Miguelensis Greene. Probably woody or shrubby at base; stems, peduncles, leaves, bracts, pedicels and keel the same as in *A. candidissimus*; leaflets in ten to thirteen pairs, two-thirds of an inch long or less; flowers in a dense head or very short spike; calyx short-campanulate, cleft deeper above, teeth triangular-subulate, unequal, the lower nearly the length of the tube which is one and one-half lines long; flowers inclined to be reflexed, ochroleucous; keel three lines longer than calyx teeth; wings narrowly and obliquely lanceolate, and slightly ascending, two lines longer than the keel; banner ascending in a broad arc, and tip nearly erect, oval, a line longer than the wings; pods in a dense head, an inch long, exactly those of *A. candidissimus*, but perfectly glabrous, membranous and a little stiffer than the other, striate and faintly corrugated crosswise; seeds dark and nearly round. The upper stipules are not connate, though the lower ones are. The spike and flowers remind one of *A. Canadensis*. Collected by E. L. Greene at San Miguel Island, Cal., September, 1886. As Mr. Greene has suggested, this is probably a form of *A. anemophilus*, unless there is a good character in the flowers, and I doubt that. This plant from the Herb. Cal. Acad. is ticketed in the handwriting of Mr. Greene, but differs in a marked degree from his description in Pittonia i, 33, and it differs from *A. anemophilus* more than that does from *A. candidissimus*. The pubescence is woolly but with some straight hairs in places. As the stipules vary there is really nothing but the woolly pubescence to keep *A. candidissimus*, *vestitus*, *anemophilus* and *Miguelensis* from being combined; this is, however,

a character of great weight so far as my knowledge of the genus goes, yet it may be variable in the southern and hot regions.

Astragalus fastidiosus (Kell.) Greene. *Phaca fastidia* Kell. Hesperian iv, 145. I doubt if this is a valid species. It is too near *A. curtipes*, and all of the species given in the Botany of California along with *A. curtipes* are founded on weak distinctions. This species is like its relatives, not only inclined to be shrubby at base but most manifestly so. The leaflets are two to six or more lines long, obovate to almost linear, obtuse or retuse, narrowed at base and about nineteen; peduncles at least six inches long; calyx teeth shorter than the tube or not longer; pod semi-ovate, narrowed but not acuminate at base, apex acuminate or rather short-pointed, incurved; stems densely white-hairy; leaves almost glabrous to white-pubescent. Described from type collected on Cedros Island, by E. L. Greene.

Astragalus pachypus, Greene. This most distinct and very interesting species would be referred to the *A. nudus* section if it were not almost two-celled. This frequent finding of plants that destroy all our notions of classification into Astragalus proper and Phaca, leads one to hope that the division of the pod will take a minor place, so that species that are otherwise related may be grouped together and not widely separated, as they are at present in the common methods of classification. In addition to the published description I find that the pod is very much laterally compressed and is one-celled at the apex.

Astragalus collinus, (Dougl.) var. *Californicus*, Gray. *A. Californicus* Greene, Bull. Cal. Acad., iii, 157. This plant reminds one forcibly of *A. Drummondi* in habit. It is erect; leaves without a petiole to speak of, two to three inches long; leaflets about ten pairs, set very close together, three-quarters of an inch long, obtuse or emarginate; peduncles about three times as long as the leaves; calyx campanulate or occasionally very shortly cylindric, tube two lines long, one and one-half lines wide, teeth one-half a line long and broadly triangular, calyx rather sparsely short-hairy, yellowish; legume vetch-like, one and one-half inches long and two and one-half lines wide, acuminate at base, on a stipe four lines long, sharply acute at

apex, and pendulous; keel exceeding the calyx teeth by two lines, wings one and one-half lines longer than keel, and banner two lines longer than wings, banner erect, wings and keel arched, broad tip of keel incurved at a right angle. Otherwise, as in *A. collinus.* Described from the type collected at Yreka, Cal., by E. L. Greene. This differs from *A. collinus* (*Phaca collina* Hooker) as described in Flora of North America, T. & G., 347, in the leaflets being closely set and not "remote," shorter, peduncle longer, calyx not "tubular" nor "elongated" but campanulate as a rule, and in the banner being much longer than the elongated wings. It differs from the description given in King's Rep., p. 444, in the pod being linear and not linear-oblong. Watson there gives the calyx as oblong-campanulate or cylindric, and the pod as an inch long. Canby, in Botanical Gazette, xii, 150, gives it as his opinion that this is only a variety of *A. collinus.* No one seems to have remarked upon the short keel and close set leaflets. If these are common to the true *A. collinus*, then, no doubt, this is a form of *A. collinus.*

Astragalus Mogollonicus, Greene, Torrey Bulletin viii, 97. This is only a form of *A. Bigelovii* apparently, as it is a common thing for *A. Bigelovii* to be very hirsute with yellow hairs, and the pod is from oval and short pointed to lanceolate and rather long pointed. The immature pod of this plant is straight and cylindric-lanceolate. Rusby's specimen is fully as large as *A. Bigelovii* and like it in all respects so far as can be seen, but it has no mature fruit, while Greene's specimen, the type, is very young and without fruit at all. I have a specimen of *A. mollissimus* from the same region, the San Francisco Mountains, Ariz., that, so far as the yellowness is concerned, would pass for *A. Mogollonicus* were it not for the cylindrical and perfectly glabrous pods.

Astragalus calycosus Torrey var. *scaposus* (Gray) *A. scaposus* Gray, Proc. Am. Acad. xii, 55. *A. candicans* Greene, Bull. Cal., Acad. i, 156. It is strange that Dr. Gray did not recognize the close relationship of this plant with *A. calycosus.* It has only the remotest resemblance to *A. Missouriensis* and no relationship to it. The true *A. scaposus* differs from *A. calycosus* only in the short and triangular calyx lobes and the less

deeply cleft wings, and longer calyx tube. It is a little more robust and with larger flowers, but I have specimens from the Buckskin Mountains, Northern Arizona, on the border of Utah, with the calyx lobes one-half as long as the tube, and not deeply cleft wings. My specimens of *A. scaposus*, named by Dr. Gray himself, show a great diversity in the lobing of the wings. Specimens from Southeastern Utah, collected by Miss Eastwood, have a short calyx and short teeth, but are otherwise as in *A. calycosus*. I have given a full description of *A. calycosus* in "Contributions No. 3," so that it is not necessary to repeat the character of the pod, which differs in no respect, when fully developed, from *A. scaposus*. I have compared the type of Mr. Greene's *A. candicans* and find that it differs in no respect from *A. scaposus*.

Astragalus Hosackiæ, Greene, Bull. Cal. Acad. i, 157. This is a common form of *A. humistratus*. I have plenty of specimens, gathered along with the usual form of *A. humistratus*, that have the pod of *A. Hosackiæ* and the general form of the leaves of *A. humistratus*. I have others with the leaves and general aspect of *A. Hosackiæ*. Mr. Greene's species seems to grow in the shade, where the leaves become wider. The pod of *A. humistratus* varies greatly, being curved to a half circle or nearly straight and short; it is also a little sulcate dorsally often. The crowding of the leaflets and leaves is of common occurrence.

Astragalus Gilensis Greene, Torrey Bull. viii, 97. This is a very distinct and interesting plant, but belongs to the Homalobi. The keel is incurved and sharply acute, one-half a line shorter than the wings, banner one to one and one-half lines longer than wings, the keel exceeds the calyx teeth by a line only; calyx tube one and one-half lines long, narrowly campanulate equaling the subulate teeth; bracts hyaline, acuminate, lanceolate, one and one-half lines long, longer than the short pedicel; calyx contracted at base; flowers in a head which is one-half an inch long; pod flattened laterally, about two-seeded, obliquely ovate-oblong, one-celled, no intrusion of sutures, thin-chartaceous, dorsal suture about straight, ventral much arched, the pod seems to be wrong side up but it is not so, sharp pointed,

both sutures prominent externally, pod three lines long; lower stipules large and hyaline and densely imbricated; leaflets five to eight pairs two to three lines long, elliptical and appressed silky; leaves two inches long, root woody and large. This seems to be near to *A. miser*. This description is drawn from the type collected on the Gila River, by E. L. Greene. I do not attempt to give a full description, as the other characters are given by Mr. Greene.

Astragalus insularis, Kellogg. I do not know where this was first published. Annual or flowering the first year. The small plants have the habit of *A. Geyeri* and a remote resemblance to *A. triflorus*. Many-branched at the summit of the root and rather slender, lateral branches probably prostrate or ascending, and the central ones erect or nearly so. Flowers two lines long, keel, wings, and banner nearly equal, not curved; very campanulate or globose calyx sessile and as long as the subulate-triangular teeth, calyx and teeth scarcely over a line long in all, calyx reflexed in fruit; pods broadly ovate, sessile, membranous, one-celled and not sulcate, sutures scarcely visible, pod much inflated, about five lines long, rounded at base and with a triangular laterally flattened, sharp apex which is one or two lines long, the beak is flattened so as to be no thicker than paper in the second form given below, cross-section of pod apparently circular; peduncles one to two inches long, rather stout, shorter than the leaves, three to six-flowered, racemosely and remotely on the upper half of the peduncle; leaves with three to five pairs of elliptical-linear and apiculate leaflets which occur on the upper half of the rachis or common petiole; whole plant, even to the pods, minutely pubescent. Cedros Island, collected by Dr. Veatch, 1877, June 4th. Another form, if such it be, is the upper part of a stem that may have been a foot or two long; it has seven to nine pairs of acute leaflets, six lines long, no proper petiole; leaves four inches long; peduncles two and one-half to three inches long and stout; pods globose but with the peculiar beak three lines long. Cedros Island, Dr. Veatch. This species seems to belong near *A. macrodon*. *A. Pondii* Greene, Pittonia, i, 288, is the same so far as the published description goes.

Astragalus streptopus Greene, Bull. Cal. Acad. i, 156. This I take to be a form of *A. Nuttallianus.* The only difference seems to be that the flowers are a little more numerous and racemose and the leaflets are often retuse. I have specimens with racemose flowers, and others with the pods wrong side up by the twisting of the pedicels, and otherwise intermediate.

Astragalus albens Greene, seems to be a good species but very close to *A. Nuttallianus*, though Watson places it near *A. tricarinatus.* It would pass for a form of *A. Nuttallianus* with wider leaves and tips of pods. If this is a perennial it blooms the first year. It is prostrate or ascending, six inches or more long, many branched from the base; raceme loose; peduncles twice as long as the leaves, which are one to two inches long, petiole over one-half of the whole; keel purple tipped, very broad and blunt, longer than the wings and equaling the broad banner, two lines longer than the calyx and teeth, which are a line long, teeth equaling the campanulate tube, pedicel nearly as long as the tube; pod broadly linear, narrowed and pseudo-stipitate at the base, broadest at apex, which is sharp-pointed and triangular, laterally compressed, minutely and rather sparsely short-pubescent, not at all silky except when very young, two-celled. Described from the type.

Astragalus Rusbyi Greene, is a good species. I also collected it in abundant material near Flagstaff, Ariz., 1884.

Astragalus malacus Gray, var. *Layneæ* (Greene). *A. Layneæ* Greene, Bull. Cal. Acad. i, 157, belongs to the Micranthi. In addition to the characters given I find the flowers are purple, one-half an inch long; wings narrow, just surpassing the keel, and banner but little longer; banner ascending; keel apparently with an obtuse short beak; leaves almost oval, very villous-woolly, the hairs very fine, not much tangled in the type but much so in Parish's specimens, attached by the small pustulate base, the leaflets in the Mrs. Curran specimens are obovate; the flowers seem to be reflexed and the pods erect; calyx campanulate, nigrescent, three lines long, with very short, triangular, black-hairy teeth; peduncles very stout, twice longer than the four-inch-long leaves, or subscapiform, and eight inches long in Mrs. Curran's speci-

mens; stipules large, connate below, acuminate and hyaline. In Mr. Parish's specimen the pod is nearly two inches long, linear, contracted at base and sessile, sulcate dorsally, and dorsal septum intruded to the middle of the cell, apex of pod acuminate to an almost thread-like tip which is laterally compressed, pod slightly obcompressed, finely corrugated, coriaceous, rather sparsely villous-woolly when ripe, ventral suture rather prominent; pedicels very short; bracts ovate and rather large. In Mrs. Curran's specimen the pod is completely divided by the intrusion of the dorsal sulcus from the base nearly to the apex, much obcompressed by necessity from the curving of the pod into a circle, ventral suture ridged; perennial and many branched from the base, erect, stem very short.

The above descriptions are drawn from the types. I find that the pods have much shorter pubescence which is more generally appressed; the plants are less branching and peduncles more inclined to be subscapose, and the flowers are more inclined to be racemose; the sulcus is more open and wider; pods narrower than *A. malacus*. Specimens collected by Mr. Brandegee, at Inyo, Cal., April 15, 1892, clearly connect the two. The flowering specimen of the Herb. Cal. Acad. has white or ochroleucous flowers with only a tinge of purple at the tip of the parts; calyx that of *A. Layneæ* and pods of *A. malacus* with the short pubescence on them of *A. Layneæ;* pods not at all obcompressed but decidedly compressed; general habit of *A. Layneæ*. The fruiting specimen on the same sheet has nearly the calyx of *A. malacus* and its branching caulescent habit, but the pods are those of *A. Layneæ*. I also have specimens of *A. malacus* from Western Nevada with pods much like those of *A. Layneæ* but nothing to warrant the reference that Mr. Brandegee's specimens require. I find in Mr. Brandegee's specimens that the keel is as often without a beak as with, and so that character fails.

Astragalus Gibbsii Kell. (*A. cyrtoides* Gray.) The type in the Herb. Cal. Acad. has eight to ten pairs of obovate-cuneate leaflets which are so deeply notched as to be obcordate occasionally, at other times they are scarcely notched at all, seven lines or less long, four lines or less wide, shortly petiolulate; petiole less than an inch long; stems and peduncles grooved; corolla

and calyx yellow, the latter with short wool; calyx tube three lines long, two lines wide, teeth a line long and triangular and stout; calyx about as large at base as apex and so short-cylindric; the corolla does not extend more than five lines beyond the calyx teeth; the short very blunt keel whose tip is bent into a semi-circle surpasses the teeth by three lines; the broadly lanceolate wings which are as wide as the keel surpass it by two lines; the broadly ovate banner is sharply arched just beyond the calyx teeth into an erect position and so does not extend as far as the keel; the ovate woolly bracts are hyaline and a line long and equal the stout pedicels; lower part of stem is absent and there is no fruit; stipules triangular, short, green. Collected by G. W. Gibbs on the headwaters of the Carson River, Cal. Read before the Cal. Acad. Nov. 18, 1861. The whole plant has short spreading wool or hairs and is rather canescent; pedicels attached by one corner of the calyx; leaves four inches long; peduncles six inches long, very stout; flowers six to eight, subcapitate.

Astragalus cyrtoides Gray, collected by Lemmon in Sierra Valley, Cal., is many stemmed from a woody root, stems often slender, erect and scarcely sulcate, a foot high, flexuous; pubescence even to the calyx the same as in *A. Gibbsii;* leaflets six to eight pairs, from cuneate and almost lobed at apex to oblanceolate and truncate, six lines or less long; petiole seldom over one-half inch long; leaves three inches long; stipules triangular and like those of *A. Gibbsii* but more acute; peduncles four to six inches long, not very stout, grooved; flowers loosely spicate; pedicels two lines long, twice the length of the ovate, hairy bract, not very stout; calyx narrowed, cylindric-campanulate, four lines long, one to two lines wide, scarcely gibbous at base but pedicel bent at point of insertion to a right angle; teeth the same as those of *A. Gibbsii* or narrower; flowers the same but wings surpassing the keel only a little; pod an inch long exclusive of the one-half inch long stipe, acuminate at both ends and sharper at base, three lines wide, one and one-half lines thick, cross-section, shallow-obcordate, short-pubescent with erect hairs, one-celled, neither suture impressed, but pod dorsally sulcate, ventral suture

prominent and sharp edged externally, pod arched into one-third to one-half a circle, erect.

Specimens collected by Mr. Brandegee at Milford, Cal., June 26, 1892, are substantially those of Mr. Lemmon but calyx gibbous, more cylindric; pods less acuminate, and stipe just equaling tip of calyx teeth; pods shorter, slightly arched, both sutures prominent, not at all sulcate or with only a trace of it.

My own specimens gathered at Carson City, Nev., May 23, 1882, are exactly the type of *A. Gibbsii*. Those collected also by me at Empire City, Nev., June 20, 1882, and distributed as No. 3829 have the flowers of *A. Gibbsii* but the calyx a little narrower; pedicels as long or two lines long; leaflets six to ten pairs, like those of Mr. Lemmon's specimens, short-woolly, and whole plant canescent throughout; pods very short-pubescent, not at all sulcate, cross-section about circular, pod an inch long, bent into fully or more than a semi-circle; stipe equaling or twice as long as the calyx; pods oblong-linear, shortly and equally acuminate at each end, stems branched above, a foot high. Other specimens gathered at the same place have pods the same width as the above but only one-half an inch long, very sharply acuminate; stipe shorter than the calyx; pod slightly arched, otherwise as above.

Astragalus recurvus Greene. This is *A. obscurus* Watson. I have specimens of *A. obscurus* from Nevada collected by myself with recurved pods, and also specimens from Northern Arizona collected by me near Flagstaff in 1891 with the pods curved fully as much as the type and with crimped edges.

Astragalus adsurgens Pall. This species is in great need of a new description for the lobes of the calyx are often as long as the tube, the leaflets vary from linear lanceolate and one and one-half inches long to oblong-elliptical and obtuse or acute. The pods are one-celled, sulcate dorsally from one-fourth to one-third their width and dorsal septum produced as much more into the pod, but never two-celled; the flowers are purple or white. My specimens were named by Gray.

Astragalus circumdatus Greene. Scytocarpi, and nearest to *A. Chamæleuce*, but widely different from it. In uniqueness it ranks

along with *A. pachypus.* Apparently loosely cæspitose from a much branched woody base, two to five inches high or more, stems rather slender though not for the size of the plant, nodes one-fourth to one-half inch apart, or even closer; stipules rather large for the plant, scarious, ovate, almost connate, free; stems three to five inches long, ascending or some of them horizontal, almost glabrous; leaves two to three inches long with petiole which is nearly one-half the length; leaflets eight to twelve pairs, one-fourth inch or less apart, truncate or emarginate, oblanceolate to oval, one to four lines long, very decidedly petiolulate, very sparsely pilose, or almost glabrous, the leaves are so small that though the hairs are short they are still long for the size of the leaf; peduncles slender, shorter than the petiole and far overtopped by the uppermost leaves which are not at all reduced but are the largest of all; flowers subcapitate, five to twelve, on slender pedicels which are one to one and one-half lines long and twice the length of the ovate, hyaline, rather pilose bract; flowers horizontal, four lines long, ochroleucous in the dried specimen; calyx tube campanulate, one and one-half lines long, a little longer than the subulate lobes, whitish, rather densely short-hairy and canescent; banner very wide at base and narrower upwards, emarginate, bent at a right angle and erect, a line longer than the keel; keel nearly straight but tip incurved at a right angle and acuminate, the erect part nearly as long as the rest of the blade; wings apparently lanceolate, ascending and little exceeding the bend in the keel; pod apparently horizontal or reflexed, fleshy, coriaceous, one-celled, neither suture impressed but both very thick and prominent and rounded externally, pod minutely and sparsely pubescent when mature, or glabrous, faintly corrugated, abruptly acute with a stout beak and almost acute at the sessile base, six lines long or less, half oval to almost elliptical, ventral suture nearly straight, dorsal arched, apparently a little compressed when young but nearly round thereafter in cross-section, faintly bisulcate on the ventral side but the obcompressed appearance is doubtless due to the pressing, as other pods are as markedly compressed from the same cause. The flowers and pods lie among the leaves but are not concealed by them, usually only two to four pods mature on the

same peduncle and are scattered. The immature pods are quite appressed-hairy. Described from the type in the Herb. Cal. Acad. Collected by Mr. Lemmon at Hanson's Ranch, Lower California, July, 1888.

ASTRAGALUS ANISUS, n. sp. This is near the Mollissimi. Very low, two or three inches high and very short-stemmed, perennial, silky pubescent, with rather long and loosely appressed hairs which are slender, very echinate, and attached by the middle; stems, stipules, and leaves silvery with long hairs; peduncles less pubescent; calyx nigrescent only, with sparse hairs; pods softly and rather thinly pubescent with short hairs. Leaves two inches long and petiole as long as the rachis, leaflets three to six pairs, obovate to oval, two to three lines long. Peduncles longer than the leaves and with stout fruiting pedicels two lines long. Flowers erect or spreading, six to ten and probably subcapitate; calyx-tube broadly cylindric, four lines long exclusive of the subulate teeth which are less than a line long; corolla not seen; pods almost an exact oval, very obtuse at each end but apiculate at apex and abruptly contracted into a pseudo-stipe which is very short, at base two-celled, six lines long, chartaceous, finely corrugated, sulcate ventrally but not deeply, and slightly sulcate dorsally often. Collected at Pueblo, Colo., by Miss A. P. Lansing, and communicated by Miss Alice Eastwood.

ASTRAGALUS WETHERILLI, n. sp. With the habit of *A. triflorus* and nearest to *A. allochrous* in general character except the jointed pedicel. Ascending twelve to eighteen inches high and many stemmed from a rather woody, perennial root, glabrous or very sparsely pubescent on the upper stems and rachis; calyx nigrescent with short hairs; young pods ashy with minute white hairs, mature pods very sparsely and minutely pubescent. Stipules small. Lower leaves small, one to two inches long, with four to five pairs of obovate rounded to retuse leaflets, two to three lines long; uppermost leaves largest, three to four inches long, including the inch-long petiole; leaflets, six to eight pairs, oval to obovate, obtuse, four lines long. Peduncles one to two inches long and capitately six to eight-flowered, rather stout,

with pedicels a line long in flower and two lines long in fruit, twice as long as the ovate bract. Calyx narrowly campanulate two and one-half lines long including the subulate teeth which are a line long; flowers four lines long, white with pink-tipped banner, keel straight to the abruptly incurved (to a right angle) apex, one and one-half lines longer than calyx teeth, wings just surpassing the keel and upwardly curved so as to conceal it, banner two lines longer than keel, broad, rounded, ascending somewhat; pods three-quarters to an inch long, obliquely ovate and shortly acuminate, obtuse at base but contracted, jointed to the line-long stipe at its apex, thin-chartaceous, not pendulous or purple spotted, sulcate ventrally, not at all dorsally, ventral septum also extended a line deep in the centre of the pod but not at all at each end, straight, dorsal septum bent to an arc of an oval, pod inflated and cross-section nearly round.

Collected at Grand Junction, Colo., May, 1892, by Miss Alice Eastwood, and dedicated to Mr. Alfred Wetherill by request.

ASTRAGALUS CICADÆ, n. sp. This appears to be near *A. megacarpus*, and has the habit and general appearance of *A. amphioxys.* Perennial, depressed, and almost stemless, three to four inches high. Stipules large for the plant, hairy, acute, and connate below. Petioles, peduncles, and leaves silvery with appressed, very acute, echinate, hairs that are fixed by the middle. Leaves about two inches long, with three to four pairs of broadly to narrowly elliptical leaflets, three to four lines long. Peduncles one and one-half inches, long, decumbent, capitately few-flowered, and with pedicels a line long equaling the ovate, acute, hairy bract. Calyx broadly cylindrical, nigrescent with sparse and very short hairs, four lines long exclusive of the subulate teeth a line long; flowers apparently ochroleucous, exceeding the teeth by four lines, keel nearly straight and but little incurved at the obtuse tip, wings a trifle longer, and nearly equaling the slightly ascending banner; pod obliquely oblong lanceolate, one and one-half inches long, shortly acuminate, somewhat incurved, not stipitate, but a little contracted at base, minutely and rather sparsely pubescent,

purple spotted, young pod pulpy and corrugated, mature pod with membranous outer coat very coarsely reticulated transversely and suggesting the wing of a cicada, inner skin stiffer, both sutures much thickened within and pulpy but not much intruded, pod occasionally slightly sulcate ventrally, very acute.

Grand Junction, Colo., May, 1892. Collected by Miss Alice Eastwood.

The following forms, except the first, would readily pass for new species, but in view of the great variability in the pod of *A. Preussii* it seems better to describe them as varieties until the real limits of that species are known.

Astragalus Preussii Gray, Proc. A. A. vi, 222. See also Vol. xiii, 369, and Bot. King's Exp. Rev. Astragalus, Watson.

The specimens collected by Miss Eastwood at Moab, Utah, May, 1892, approach the type very closely. Glabrous throughout except calyx speckled and teeth black with flat, short-twisted hairs fixed by the base, plant a foot high; leaflets oval to narrowly elliptical. Peduncles equaling the leaves, stout, five to ten-flowered; flowers spreading and in fruit ascending, purple, three-fourths of an inch long; pedicels a line long and twice shorter than the ovate, hyaline, acuminate bract; calyx five lines long, two lines wide at base, and one and one-half wide at throat, cleft a little deeper on the upper side, teeth subulate, a line long; keel straight, to moderately incurved at blunt apex and scarcely shorter than the wings, banner elongated, purple veined, ascending; pod with evident sutures, abruptly contracted at each end, and with subulate point at apex a line long, this broad based beak is very characteristic, the stipe is about two lines long, and the pod is oblong elliptical. Otherwise agreeing with the type exactly. Collected by Miss Alice Eastwood at Moab, Utah, May, 1892.

Astragalus Preussii Gray var. LATUS, n. var. Leaves obovate-cuneate to nearly linear; peduncles longer than the leaves; calyx cylindrical; banner shorter and wings longer than in the above; pod nearly round, but ventral suture nearly straight, three-fourths of an inch long, apex subulate three lines long and prow-like, stipe two lines long; pod thick-chartaceous, but not

coriaceous. Plant a foot high, or less, and growing in dense clumps. This is seemingly very distinct, but is connected with the type by forms with ovate pods. In pubescence, pedicels, calyx, and corolla it agrees with the type. Collected by me at Green River, Utah, May 7, 1891, and connecting forms at Cisco at the same date.

Astragalus Preussii Gray var. SULCATUS, n. var. Densely branched from the base which is almost woody, six inches high. Stipules not large lower ones sheathing, hyaline, very broad and blunt. Leaflets about ten pairs as in the type, but generally narrowly oblanceolate, two to four lines long, rachis two to four inches long, and proper petiole very short. Flowers a line shorter than type on pedicels two lines long, which are twice the length of bract. Calyx three lines long, cleft a little deeper than the type and not contracted at throat, otherwise both calyx and corolla as in the type. Pods horizontal, oblong-oval, abruptly contracted at both ends, apex very acute with a short triangular beak, pod round in cross-section, straight, ventrally sulcate a line deep and suture often extended one-fourth of a line deeper, pod much inflated, chartaceous, three-fourths of an inch long, often reddish, but not spotted. Collected by me in abundant specimens May 6, 1891, at Westwater, Colo., and in fruit only by Miss Alice Eastwood, at Cane Spring, Utah, May, 1892. This is so like the variety *latus*, except in the sulcate pod, that it seems best to put it as a variety of the above.

Astragalus pictus Gray var. ANGUSTUS, n. var. Like the type but pods eight lines long, two to three lines wide, oblong-oblanceolate very acute at apex and narrowed gradually into the stipe which is as long as the calyx. Collected in Montezuma Cañon, Utah, May, 1892, by Miss Alice Eastwood.

Astragalus desperatus Jones. Specimens collected by Miss Eastwood have the over-ripe pods almost chartaceous.

Astragalus Coltoni Jones has the pod in one specimen broader and less stipitate, and in another specimen has the leaves much broader, otherwise as in the type.

ASTRAGALUS PALANS. Stems long and flexuous ascending or erect from a perennial root, nodes distant, glabrous throughout

except the sparsely nigrescent calyx. Leaves three to four inches long and with a very short petiole, central ones the largest, leaflets on the lower leaves three lines long and obovate and rounded, eight to ten pairs, central leaves with leaflets one-half inch long, obovate to elliptical and retuse. Peduncles very stout, sulcate and longer than the leaves, six inches long and widely spreading, racemosely six to ten flowered near the apex, pedicels a line long and equaling the bract, stout; calyx tube campanulate cylindrical, two lines long, hyaline, somewhat reflexed, teeth one and one-half lines long and filiform from a broad base, keel moderately arched, surpassing calyx teeth by three lines; faintly pink tipped, narrowed at obtuse apex, wings about equaling the keel and the banner is a line longer and pink. Pods about linear, very acutely beaked, sessile, base pendent and apex erect, the pod being bent nearer the base than apex into a sharp curve so that in some cases the apex touches or surpasses the base, very slightly obcompressed, very slightly sulcate dorsally and occasionally so ventrally, dorsal septum produced so as to make the pod almost two-celled, but not quite. This plant seems to be nearest *A. distortus*, but is quite peculiar. Montezuma Cañon, Utah, June 1, 1892, Coll. by Miss Alice Eastwood.

NEILLIA.

It was my intention to take up this genus later, but in going over my herbarium to fill out some exchanges it has come in my way to study the whole genus.

The recent revision by E. L. Greene has changed the nomenclature considerably.

My method of field study for the last fifteen years has been to collect a large amount of typical material for my sets and exchanges, and to collect for myself from one to five or more specimens of flower and fruit of every deviating form, and to accompany them with such notes as the specimens would not show. I have in this time gathered from a wide field, from Iowa to California, a large amount of material on this and other genera. It early became evident that the characters of Watson's *Neillia Torreyi* as given by himself were valueless, and I sent him a full suite of material showing it, but with his usual persistence he

would not yield. I then decided to take up the genus myself, but lack of time has prevented till now.

I find that the lobation and dentation of the leaves are of little value, also the inflated calyx with connivent lobes, and the shape of the seeds, as well as the pubescence of the pods. The number of seeds in the carpels is very treacherous. The stamens are almost always twenty, in *N. opulifolia* in two ranks and about forty, and the anthers broadly or narrowly oval, the filaments are usually slightly wider at base only and about a line long. The pubescence is always stellate or at least branched in that fashion, but is very variable, and of almost no value. The seeds are always oblique. All the leaves of the genus are three-nerved, five-nerved only by accident.

Taking the order as given by Mr. Greene *N. opulifolia* (L.) Watson, comes first under the heading of "carpels inflated, exserted from the calyx, divergent at apex, bivalvate-dehiscent." The pods are divergent of necessity and are bivalvate-dehiscent a little below the middle to the apex only and not throughout. The range is given as from Canada and Florida to Kansas, while the plant is rather common in Colorado, at least at the base of the mountains on their eastern side at the junction with the Plains. Mr. Greene gives the chief characters as "leaves round-ovate, three-lobed, doubly crenate-serrate, carpels three, four, or five, connate below, one-third inch long, much inflated, usually two-seeded; seeds broadly obovoid."

In my specimens from South Boulder, Colo., collected August 15, 1878, at an elevation of 6000 feet above the sea, and distributed as No. 914, I have one branch with the following leaves on it, one leaf orbicular, not lobed, doubly crenate-serrate; two leaves rhomboidal, lobeless, and doubly serrate as above, base truncate; two leaves rhomboid-ovate, with a very broadly cuneate base, barely three to five-lobed; all the above leaves are rounded and very obtuse at apex; several leaves broadly ovate and barely acute and distinctly lobed above and in other cases below the middle; several others are ovate-lanceolate and very acute and lobed as above. The leaves are from one-half to two and one-half inches long. The pedicels are about an inch long, densely stellate pubescent, the stalk of the stellate hair

very short and the branches very long; calyx densely short-woolly within and without, lobes triangular-ovate and obtuse, a line long, equaling the tube; carpels two or rarely three, flattened, not greatly inflated, very acute, one-third inch long, tips widely divergent, dehiscent a little below the middle, appearing to be glutinous hairy but under the lens vitreous shining and very sparsely hairy with long hairs that are more or less stellate; seeds usually one in each carpel, from ovate to oblong-lanceolate, scarcely a line long and with or without a sharp inner edge, nearly acute, smooth, shining and yellow. Other specimens from the same locality have various intermediate leaves as to serration, lobation, and shape, all showing how futile is the attempt to make a character on the leaves. The venation of all the Neilliæ is really racemose in threes, and not digitate except by accident. On examining a large number of leaves we find that usually the three primary veins come out at the base of the leaf within one-quarter to two lines of each other racemosely, and only rarely exactly opposite, except in *N. monogyna* where it is more common, but this remark as to the racemoseness applies with equal force when there are five apparently digitate veins from the base; in this case the two lateral main veins are branched at base or within a line or two of it. Above the base of the leaf, about four lines, the central vein sends off a pair of secondary veins that are about one-fourth a line to a line apart, and so on. The two lateral main veins branch on the lower side into one or usually two secondary ones, the first near the base, and after that they branch like the main central vein above. The large lateral veinlet is often so near the base of the leaf as to be as near it as the point of separation of the main ones and then is called the fifth vein, but though this can be found in single or a few leaves of a plant it is always less common than the regular form. I have found it on every recognized species of Neillia.

In my specimens from Bear Creek Cañon, near Colorado Springs, the leaves are from rhomboid-ovate to lanceolate, but usually broadly ovate, one inch to three inches long and one-half to two and one-half inches wide; calyx always short-woolly on both sides, cleft two-thirds the way to the base, two and one-half lines long; pedicels glabrous or stellate-woolly;

carpels three to five, barely surpassing the calyx or even five lines long, much inflated and almost cartilaginous when short, shining and very sparsely hairy, or in the larger ones membranous, flattened, inflated much or little, abruptly acute, not greatly divergent, seeds one or more, broadly obovate, one-half a line long, ovary always densely white-hairy. From the above it will appear that the leaf character, length of carpels and shape of seeds are very variable in the oldest species.

Neillia opulifolia (L.) Brewer & Watson, var. *mollis*, Brewer & Watson; *N. capitata* (Pursh), Greene, Pittonia ii, 29.

My material comes from Oakland and from Duncan's Mills, Cal., and was collected by myself. So far as my specimens go the following is true: Leaves broader than in the type, two to two and one-half inches long, and fully as wide or wider, lateral lobes a little larger than in the type, and very rarely is there any evidence of secondary lobes, as is almost always to be found in the other species of Neillia; leaves more pubescent, and more or less cordate at base; carpels vitreous shining, inflated, very sparsely pubescent, shortly acute; seeds lanceolate obovate, incurved or straight; branches not very long nor climbing among the bushes. The corymbs are occasionally proliferous. The only character relied on by Mr. Greene, that of the seeds, proves in my specimens to be valueless, and I cannot see any other good character on which to keep up the species. In some of my specimens at least the seeds are a little narrowed at the apex, but this doubtless is not constant.

Neillia monogyna (Torrey) Greene, Pittonia ii, 30. This is the *N. Torreyi* of Watson, etc., in part. It may be advisable for the present to keep up this species, but there is no necessity for concealing the probable fact that it is only the most reduced form of *N. opulifolia*. No character that has ever been given it holds except the less inflated pod. Mr. Greene puts this under the head of "carpels indehiscent," but they are dehiscent doubtless when fully developed as that is the case with the variety *malvacea* (*N. malvacea* Greene). The form which grows on rocks in Colorado is alone sufficiently distinct, but unfortunately the forms growing on better soil and so better nourished differ. The

starved form I have seen hanging from the cliffs, branching widely and very pretty, and generally growing on rocks and occasionally along with *Jamesia Americana*, a foot or two high. This form is best represented by my specimens from Cheyenne Cañon, near Colorado Springs. The leaves are round and deeply cordate to broadly ovate, always three-lobed above or below the middle, lobes deep in some cases and scarcely recognizable in others, occasionally five to seven-lobed but less distinctly so, three-nerved or five-nerved on the same plant as it happens, digitately (as described in the beginning of this article), half an inch or less long, rather thin and almost glabrous; corymbs in my specimens never proliferous, glabrous or stellate-pubescent, ten to twenty flowered, petals one and one-half lines long and scarcely exceeding the sepals or lobes of calyx, flowers small. Another specimen from the same locality has leaves twice as large as well as flowers, and corymbs compound at base. This differs from *N. opulifolia* only in the monogynous ovary and slightly inflated pod, more incised and less pubescent leaves, and smaller size. Other specimens from the foothills are more robust and the most vigorous leaves are often quite acute and long-ovate. Utah forms seem to be rare. I have never found it in Utah, though I collected a peculiar form in the Schell Creek Mountains, Nevada near the western edge of Utah. This is a low, densely branched shrub with leaves one-fourth to one-half an inch long nearly round and usually cordate at base, always very obtuse, seldom more than three-lobed, but doubly crenate with the incisions very irregular, densely and often ferruginously pubescent on the nerves below and softly so all over, but upper surface less so; flowers very small, three to ten and about umbellate; petals not longer than lobes of calyx which are obscurely lacerate and hyaline on the margins, more so than in the smallest form of the type; stamens about twenty and the alternate ones one-half shorter, the larger ones with much dilated base; anthers oval and as in the type attached by the middle and apparently without a bloom while the type has a decided bloom and is oblong oval; style simply two-lobed at apex. Such marked characters would ordinarily be regarded as specific, but I prefer to call it var. *alternans*, though should

any of the characters given prove to hold, it may bear the name *Neillia altèrnans.* I fear however that it will prove to be only another of those multitudinous forms that are liable to fall into *N. monogyna* or *opulifolia.*

Neillia monogyna (Torrey) Greene *var. malvacea* (Greene, Pittonia, Vol. ii, p. 31). I have seen the type in the University of California, and recognized it at once as our common Utah form with leaves a little more developed on the sterile shoots, due to the more moist locality in which it was found. This is intermediate between *N. opulifolia* and *N. monogyna,* with the habit of the former as well as the leaves and the pod about intermediate. The calyx is not as large as in one form of *N. opulifolia* from Colorado, the lobes are of the general shape of *N. monogyna* and the calyx of every species and variety is campanulate, the lobes of all the genus would be connivent if the pods did not exceed the calyx, the calyxes of all the genus are tomentose within and without but less so without, the leaves are racemose-digitately (as given above) five-nerved in some of the larger leaves but less so than in the var. *alternans* and but slightly more so than in *N. opulifolia.* The name is not distinctive as the leaves are not so malvaceous as in *N. opulifolia* var. *mollis.* The leaves one-half to two inches long vary from reniform to ovate, lobeless to deeply three-lobed with several secondary lobes, main lobes above or below the middle, teeth minute and very many or large and few; pubescence various and inconstant everywhere except on the calyx; flowers quite large or rather small, with the general appearance of *N. opulifolia* as well as size; carpels generally two, seldom if ever inflated, united to the middle with erect or spreading tips, just equaling the calyx and lobes when well developed, slightly rugulose, shortly but not densely pubescent, and shining beneath the pubescence; seeds three, one generally larger than the others, obliquely obovate or narrower and usually somewhat flattened, as is the case with the genus, outline from the back often broadly lanceolate, smooth and shining, yellow, not larger than in *N. opulifolia* and usually shorter and broader than the var. *mollis.* The pod is dehiscent on one or both sides nearly to the middle at least in many cases though tardily; when not fully mature the pod is indehiscent

and as it is often the case that the full development is arrested by the dry weather, doubtless the majority of the carpels are by necessity indehiscent. The fruit is broadly ovate to rhombic and when the seeds occur above the middle of each carpel then it is oval, but never "orbicular" in any specimen from the Great Basin that I ever saw. The peduncles are always short and like the type. The plant is three to six feet high, grows among other brush, is widely branched and closely resembles *N. opulifolia* in general appearance, but is a little stiffer. It ranges from 7000 to 9000 feet altitude, and prefers the north side of steep mountain sides as there only can it get enough moisture. It is common in the mountains, and I have it from many localities in all stages of development.

Comparing my notes with those of Mr. Greene I find no character left to separate it from *N. monogyna* and only the flattened pod to separate it from *N. opulifolia*, while he gives *N. monogyna* as having a somewhat inflated pod which destroys the last valid distinction.

Watson reports the type *monogyna* as from the East Humboldt Mountains, Nevada, and from Stansbury Island, in Great Salt Lake. I have not seen his specimens, but presume they are the var. *alternans*.

Since writing the above I have found a fine fruiting specimen in my collection from Albuquerque, New Mexico, which belongs to the type of *N. monogyna*. The calyx is much inflated or little so, lobes often emarginate; carpels two or three in each calyx, tips needle-like and widely divergent, carpels separate to below the middle, fully as inflated for their size as the less inflated form of *N. opulifolia* from Colorado described above, or perfectly flat and silique-like, scarcely over half the length of the calyx or one-fourth longer, one to three-seeded, seeds very broadly obovate, scarcely yellow, and angular by being crowded in the carpel, carpels dehiscent and bivalvularly so to the middle. These variances all occur on the one specimen. The only way to uphold *N. monogyna* seems to be that adopted by Gray to keep up Aster, namely by an aggregation of characters no one of which is permanent, but some of which are always present when the others fail.

Prunus demissa Walpers. An examination of all my material shows that the leaves are never less than subcoriaceous and often coriaceous. The flowers are one and one-half to two times larger than those of *P. Virginiana.* The pedicels and peduncles are stouter, but longer. The shape of the leaves varies, but, on the whole, they are narrower, the bloom on the under side of the leaves varies from about the same as that of *P. Virginiana* to almost white in a specimen gathered at Albuquerque, New Mexico. The bark is duller, but otherwise I see little difference. The fruit of both is very astringent. *P. demissa* is a little stiffer than *P. Virginiana* in habit. I am very familiar with *P. Virginiana* as it exists in Iowa, and have abundance of material from there. I am very familiar with *P. demissa* as it exists in Utah, Nevada, Colorado, and New Mexico. All of my specimens from Colorado are *P. demissa.* I distributed them in 1878 as *P. Virginiana*, as at that time all those forms were supposed to be *P. Virginiana.* I doubt that *P. Virginiana* exists in Colorado. My studies confirm those of Mr. Greene, except in a few unimportant particulars, as given in Pittonia under the head of Cerasus.

CYMOPTERUS, SECTION COLOPTERA (C. & R.)

A recent examination of all my material makes it clear that this genus of C. & R. is not well founded. The character given by them in their Revision of the Umbelliferæ, p. 49, is substantially as follows. I omit such characters as are not supposed to be peculiar to the genus.

Coloptera. Involucre none; lateral wings of fruit corky thickened, dorsal filiform. All other characters given belong equally to Cymopterus. The whole genus is really founded on the corky-thickened lateral wings, a character that is also found in other species of Cymopterus in varying degree, but is concealed by the prolongation of the wings beyond the thickened part. This is seen in *C. montanus*, and were it not for the greatly produced edge of the wing it might be taken for a Coloptera, though there is no thin space between the base of the wing and the seed, as is the case in true Coloptera. In *Cymopterus Jonesii* the thickening of the wing is carried to the utmost limit at the base, and is also contracted a little there at the junction with the seed. In *Cymop-*

terus glomeratus the transition is complete. I have specimens collected at Colorado Springs, Colo., whose seeds if taken from the plants would be referred to *Coloptera Jonesii* by the appearance of the wings. This is No. 16 of my Colorado collection of 1878, now distributed widely. In *Coloptera Jonesii* the thickened part of the wing is rather firm ("corky") and varies greatly in thickness, and usually has a thin edge beyond the corky part. In what must pass for *Coloptera Parryi*, from fifty miles south of Lee's Ferry, Ariz., I find the wings much thinner than in *Cymopterus glomeratus*, and most of them with scarcely a trace of thickening, and in none of them would it be noticed by a casual look, but the plant is no doubt a true Coloptera otherwise, the more numerous oil tubes, the minute involucre, and the yellow flowers being the only distinguishing characters. In *Cymopterus globosus* the wings are thickened at the apex as much as in any Coloptera, but they are very spongy and soft. In *Cymopterus megacephalus* the wings at the apex closely resemble *Coloptera Parryi* in the variable thickening. The inconstant thickening of the wings is well shown in *Coloptera Jonesii*, where the dorsal ones are as thin as paper throughout, or nearly as thick as the lateral ones. At other times the dorsal wings are absent altogether, or only a filiform ridge; the shape of the seed is various; often it is very deeply concave, at other times it is scarcely concave; the lateral wings vary much; at times they are contracted around the deeply concave seed so as to form a cup like the variety *cupulatum* of *Echinospermum Redowskii;* at other times they are wide and flat.

Another character relied upon by Coulter and Rose for Coloptera is the absence of an involucre (which is also true of *Cymopterus glomeratus*). Unfortunately they overlooked this involucre in every case except *C. Parryi*, and I doubt not that it is found in that species also if plants fitting their description in every other respect are rightly referred there. In *C. Newberryi* and *C. Jonesii* I have seldom found it absent, but when it is reduced to a vestige as is often the case it would readily pass for a fold in the top of the peduncle and would lead one to think that the top of the peduncle was fleshy in the green plant, but that is never the case. Under the microscope this is at once

recognized as a hyaline border or involucre. In both of the above species this involucre is one-quarter to two lines wide and often quite evident as much so as in *Cymopterus montanus* the more reduced forms. In *Cymopterus decipiens* the involucre is much more evident as a rule, and in some cases it is as long as the pedicels, that is its lobes which are lanceolate and acuminate and green. *Cymopterus decipiens*, Jones is a true Coloptera, and I doubt not that it will fall into *Coloptera Parryi* eventually as the thickening of the wings is of so little account, while I think that *Coloptera Parryi* will be found to have an involucre as I have described above.

Since there is no character assigned to Coloptera by Coulter and Rose that holds, it must fall into Cymopterus where all its affinities are, where it belongs in habit, structure of the seeds, involucre and involucels. The roots also are those of Cymopterus being deep seated and tuberous like *C. montanus* and *C. glomeratus*. Fortunately this reference will not increase the species nor require much change in names, and in the end will I think reduce all the described species to one. I have not now enough forms to make me feel sure that *C. Newberryi* and *C. Parryi* pass into each other, as many of my apparently connecting forms are without mature fruit. However, the following disposition of the species will hold as far as it goes.

CYMOPTERUS, § COLOPTERA (C. & R). Flowers yellow, lateral wings of seeds thickened in the middle so as to form a ring, oil tubes numerous, involucre usually minute, hyaline.

Cymopterus Newberryi (Watson), *Peucedanum Newberryi* Watson, Am. Nat. vii, 301, *Ferula Newberryi* Watson, Proc. Am. Acad. ix, 145. *Coloptera Newberryi* C. & R. Rev. Umb. 49. Leaves pinnate and pinnæ toothed or lobed, lateral wings only developed. Southern and Southeastern Utah on clayey or sandy plains. Flowers in May and fruits in May and June. Oil tubes 4–8 in the intervals, 8–10 on the commissure. Plate XXV, fig. D.

Var. *alatus*. *Coloptera Jonesii* C. & R., Rev. Umb. 50. Dorsal wings also developed and thin or corky thickened. This shades into the type and is little more than a form of the species hardly deserving to rank as a variety. Frisco and Milford, Utah, in

gravel on mesas. Blooms in May and fruits in June. I alter the name because there is another *Cymopterus Jonesii.* Oil tubes similar but 8–12 on the commissure. Plate XXV, figs. B 1, B 2.

Cymopterus Parryi (C. & R.) *Coloptera Parryi* C. & R. Rev. Umb. 50. Leaves bipinnate and divisions usually small, involucre absent (?), wings of fruit scarcely corky thickened, and dorsal ones almost equally developed, oil tubes one or two more than in *C. Newberryi.* Northwestern Wyoming, Parry. Plate XXV, figs. A 1, A 2.

To the above is doubtless to be referred *Cymopterus decipiens,* Jones, Zoe ii, 246, but this differs in having a hyaline involucre, though small, corky lateral wings, and well developed dorsal ones. Southeastern Utah, on clayey and sandy plains, growing along with *C. Newberryi,* and seeming to pass into it. It flowers in May and fruits in May and June. Though I first described this as often without an involucre, I find traces of one in every plant in my collection as given above. It would be readily overlooked by almost anyone in most cases.

Since the above was written Miss Eastwood has sent me, from Southeastern Utah, a specimen of undoubted *C. Parryi,* every peduncle of which has an involucre as described above. My surmise was therefore correct, and *C. decipiens* may be suppressed, being a synonym for *C. Parryi.*

In the plate accompanying this article the wings of *C. glomeratus* fig. C, were made too narrow at the apex. Seeds of other species figured are *C. longipes* fig. F, *C. Ibapensis* fig. E, *C. Jonesii* fig. G. The figures are taken from the seeds without soaking them up as that generally swells them out of all proportion and distorts the wings. I have made no effort to show other seed characters beside the wings.

Cymopterus glaucus, Watson. I see that Coulter and Rose in their Rev. Umbelliferæ, p. 81, say that my No. 1688 is this species, but it is not. It is probably *Cymopterus Ibapensis,* but is only in flower. *C. glaucus* is my No. 1687. My numbers never have been duplicated, so it is not necessary to give either the year or the locality of collection, the number tells it all. It is probable that some one has transposed the labels of the two

species in the collections examined. I have one specimen of *C. glaucus*, Watson with an involucre of five, purple hyaline margined, lanceolate bracts as long as those on the involucels.

ZAUSCHNERIA.

Zauschneria Californica Presl. (*Z. latifolia* Greene, Pittonia i, 26.) I am not in a position to discuss the western forms of this species or the species of Zauschneria in general if there be more than one species, but I can throw some light on the eastern forms as I know them well. The form which Mr. Greene calls *Z. latifolia* as described by him does not exist in this region so far as I have even seen, though he gives it a wide range from California to Wyoming and south to Mexico.

The common form in this region has the characters of two or three of his species, *Z. latifolia*, *villosa*, and *tomentosa*, in varying degree. A form gathered at Bingham, Utah, July 20, 1880, and distributed somewhat, but not in my sets, has the petals a line longer than the calyx lobes; stamens exserted two lines longer than petals, and style four lines longer; calyx gradually enlarging from a point about two lines above the base; the base of the calyx is bulbose-enlarged; calyx one and one-fourth inches long; capsule tomentose, stipitate; plant two feet high, erect or bent at base; leaves sparingly villous and with the usual woolly pubescence reduced to a minimum, either of very short, flattened, and burnt hairs or only a papilla where the hair ought to be, but some of the leaves always minutely woolly. It is evident that the woolliness will vary with the climatic conditions under which the plant grows, and is of no specific value. This grows among the cliffs in rocks having a shallow soil, or in crevices.

Another form collected by me at Atla, Utah, in 1879, and distributed by me as No. 1141, grew at an elevation of 8500 feet above the sea on the south slope of the cañon on an almost bare ledge, and, often found by me since in similar situations in the same cañon, is six inches high from spreading decumbent woody stems; leaves short-tomentose and long-villous, lanceolate to ovate, pinnate veined, sparely and shortly toothed; calyx enlarging from very near the base or from a point two lines above it in other

cases; stamens just exsert; capsule clavate, stipitate, sparsely villous and short tomentose; seeds smooth, favose, obovate-oblong.

Another form collected and distributed by me as No. 4270, collected at Bowie, Ariz., September 18, 1884, has leaves narrowly to broadly lanceolate, apparently glaucous, but really minutely tomentose, pilose on midrib and young shoots; two feet high; flowers twice as broad as usual, an inch long and enlarging at a point two lines above the base; uppermost leaves linear lanceolate, entire and very acute; lower leaves sharply and irregularly serrate; capsules glandular-pubescent, short stalked or nearly sessile; calyx lobes triangular and acute, nearly equaling the petals; stamens long or shortly exsert, unequal.

I see nothing in the venation of the leaves that is of specific value in any forms of Zauschneria that I know.

DODECATHEON.

This genus has received considerable attention from Dr. Gray, E. L. Greene, and Mrs. Brandegee. Dr. Gray thought he had found a new character by which to separate species, and E. L. Greene amplified Dr. Gray's species considerably. I am not in a position to throw much light on the Pacific Coast species, and I leave them to others, but I am very familiar with most of the forms of the Great Basin and of Colorado. Mr. Greene, in Pittonia ii, 72, says, under the head of *D. pauciflorum*, "The fruit of this common Rocky Mountain Dodecatheon was not known until I obtained it last year (1889)." This is not correct, as I collected and distributed the flowers and fruit of the Colorado forms in 1878 under my No. 131 in twenty different sets. I again sent them out in 1879 from Colorado. The Utah forms I distributed also in 1880 under my No. 2015. I now have both the flower and fruit of some of my original specimens.

So far as the plants east of the Sierras are concerned I doubt if any of them deserve varietal rank, unless it be one Utah form. Dr. Gray seems to have given the plants of Colorado no attention unless he considers them all to belong to the type of *D. Meadia* L.

Dodecatheon Meadia L. In the fruit retained by me in my No. 131 from Colorado the capsule is broadly elliptical ovate, and a

little surpassing the subulate calyx lobes, hardly acute; flowers many; bracts ovate and acuminate to linear and acute; corolla lobes five, about an inch long, purple; stamen tube a line long or none, yellow as in almost all other forms of the genus, purple ring present or absent; leaves oblanceolate six inches long, short or rather long petioled, entire; scapes twelve to eighteen inches high; whole plant glabrous and glandless, and the leaves not apiculate. Colorado Springs, May 30, 1878.

All the Colorado specimens in my herbarium have acute anthers, and all my Colorado and Utah specimens have the capsule splitting into five valves through the base of the style. There is no trace of an operculum large or minute falling off like a lid, as is the case in my California plants. Nearly all my Utah plants have obtuse anthers that are linear or larger at apex than below, while the opposite is the case with my Colorado specimens.

My other Colorado specimens were collected in Engelmann Cañon, June 14, 1879. They are like the above in the many flowers, bracts, corolla, and calyx, and glabrous throughout, but the stems are two feet high, leaves a foot long, linear oblancelate, or a little broader, almost acute, petiole very short, calyx oblong ovate, and just exceeding the calyx lobes, or on other stems from the same root the capsule is nearly cylindric, being a little broader at the base and one-half an inch long; in other plants from the same place the calyx is cylindric and narrow, one-half an inch long. I have a few specimens from the same locality that have broadly oblanceolate, short leaves with almost no petiole, and repand toothed, few flowers, otherwise as above, but fruit not seen.

My Utah plants No. 2015 have linear-oblancelate leaves, with petiole half the length of leaves, and broadly or scarcely margined, whole leaf two to four inches long; scapes six to twelve inches long; flowers four-merous, purple or light-colored; stamen tube none; calyx lobes subulate; bracts lanceolate to linear and very acute; capsule ovate or urceolate, not quite equaling the calyx lobes, the five valves also notched. The whole plant is perfectly glabrous. Collected at Silver Lake, 9000 feet altitude, July 30, 1880, in American Fork Cañon, Utah. Another plant

collected in City Creek Cañon, near Salt Lake City, at about 7000 feet altitude, on July 13, 1880, has broader leaves, on very long petioles, and the fruit on the same stem varies from ovate to lanceolate, equaling the calyx or surpassing it by two lines. In one pod the valves are ten and in the others five or more. This is in fruit only. In other specimens collected at Lake Shore, on the margin of Great Salt Lake, at about 4200 feet altitude, the leaves are small, two to four inches long, oblanceolate and apiculate, or rarely oval, and in that case long petioled; scapes eighteen inches long, few to several flowered; flowers five-merous, purple, small; anthers only a line to a line and a half long, and broader at the very base, tube half as long; immature fruit inclined to be cylindric.

Specimens from Sprucemont, Nevada, gathered by me on July 11, 1891, have scapes one and one-half feet high; leaves oblanceolate, barely acute, three inches long with petiole equaling blade; capsule ovate-oblong, five-valved, twice as long as the subulate-triangular calyx lobes.

Ample material from Deep Creek, Western Utah, collected June 2, 1891, has scapes one and one-half feet high, stout or slender; umbel twenty-five to fifty-flowered; pedicels one to two inches long in fruit; flowers five-merous, purple, small; stamen tube very short or as long as the anthers; anthers two lines long, with a subulate, purple beginning at base and extending above the middle, tips white as well as the margins, no purple ring; leaves four inches long or less, obovate to oblanceolate, entire, tapering into a petiole which equals the blade or is very short; capsule twice to four times as long as the subulate calyx lobes, nearly cylindric, and as in nearly all other Utah plants shortly acute, five-valved, or in many cases ten-valved.

A fruiting specimen gathered by me at Emigrant Gap, Cal., in the Sierras, July 1, 1882, has the capsule and leaves of var. *ellipticum* K. Brandegee and the anthers and stamen tube of var. *Jeffreyi* K. Brandegee. The bracts are lanceolate acuminate with filiform tips. The capsule is urceolate and a line longer than the calyx lobes.

My specimens gathered at Fall Brook, Cal., March 23, 1882, and distributed in my sets as No. 3398, have a slender scape

twelve to eighteen inches high; leaves one to two inches long, oblanceolate to obovate, quickly contracted into a short-margined petiole, finely and closely laciniate-dentate, thick; bracts and adjoining pedicels glandular pubescent; flowers five-merous, large or very large; anthers small one and one-half lines long and blunt, purple-margined and white in the centre; stamen tube about a line long, and deep purple; bracts hyaline, six lines long and lanceolate acuminate, or oblanceolate, petiolate, and green and leaf-like.

Another form collected by me at Soda Springs, Sierra County, Cal., July 27, 1881, answers to var. *Jeffreyi*, K. Brandegee.

If I were disposed I could certainly make at least three new species out of my material fully as good as any that Dr. Gray has described, but I cannot resist the conviction that there is but one polymorphous species whose separation even into varieties is warranted only by the desire to arrange the forms in some kind of succession.

EREMOCRINUM, nov. gen.

This genus belongs to the Liliaceæ, subtribe Anthericeae, and appears to be nearest to Anthericum, though it has some characters in common with Leucocrinum and Glyphosperma Watson. Perianth rotate, segments three-nerved, white and thin, nerves green; anthers linear, blunt, lobed at base, erect, basifixed and edge to ovary, smooth; filaments linear, broader at base, straight, smooth; slender style elongated, enlarged and capitate at apex; capsule oblong and bluntly lobed, cells apparently two-seeded; pedicels rather stout and jointed near the base; flowers racemose spicate; roots many, long and slender, fleshy, some horizontal; rootstock very short and erect.

EREMOCRINUM ALBOMARGINATUM. This is *Hesperanthes albomarginata* Jones, Zoe, ii, 251. The only change I would make is in the anthers and filaments which I find are not pubescent. I have not yet the mature fruit of this plant. From the first I felt sure that it was a new genus and I withheld it from publication for about a year hoping to be able to decide the matter, but being unable to satisfy myself I finally published it as Hesperanthes, though I knew it did not agree with that genus

nor any other that I knew. The name of Desert Lily will fit this plant perfectly, and this is the meaning of the generic name. The leaves are flat and narrow and not terete as would be inferred from my original description. The pollen grains are large, acute at each end and elliptical. The tip of the anthers just equals the style in flower. Capsule ovate to oval, scarcely crested.

EXPLANATION OF PLATE XXV.

EREMOCRINUM: "A" plant natural size, "B" flower and pedicel enlarged three diameters, "C" pod enlarged four diameters, "D" stamen enlarged six diameters, showing the auricled base of anther, "E" segment of perianth showing nerves, enlarged three diameters, "F 1" cross-section of upper part of leaf, "F 2" cross-section of lower part of leaf.

CYMOPTERUS: "A 1" seed of *C. Parryi* showing wings, "A 2" same with wider wings, "B 1" seed of *C. Newberryi* var. *alatus* without wings on back, "B 2" same with wings developed, one of them corky thickened, "C" *C. glomeratus* with wings thickened as much as in *C. Parryi* one form, "D" *C. Newberryi* with one rib thickened nearly as much as the lateral ones, a common occurrence; "E" *Cymopterus Ibapensis* Jones; "F" *C. longipes* with some of the wings enlarged in the middle after the fashion of the above; "G" *C. Jonesii*. The enlargement of each is shown by the fraction underneath.

NOTES ON THE FOOD OF BIRDS. I.

BY WALTER E. BRYANT.

WESTERN GREBE. *Æchmophorus occidentalis*. The stomach of a young one collected on Merced Lake, San Francisco, was distended with feathers, some of them more than 100 mm. in length. The presence of feathers in the stomachs of Podicipidæ has been observed before and attributed to the individual swallowing them while preening its plumage, but in this instance the bird was in downy plumage, and I may add that feathers alone comprised the contents of the stomach. I have also found a few feathers in the stomach of an adult, which was in poor condition, evidently having been suffering for some time from a gun-shot wound, as algæ were growing to the satiny-white breast as they do to the bottoms of boats. In more than a score of individuals of this species which I have dissected there were found small fishes or nothing.

MALLARD. *Anas boschas.* Four specimens examined from Suisun marshes. *a.* Small univalve shells in gullet. *b.* Bearded barley and barley heads. *c.* Small, sprouted seeds. *d.* Half a teacupful of barnacles in the gullet.

GADWALL. *Anas strepera.* Small seeds and sand in the gizzard.

SURF SCOTER. *Oidemia perspicillata.* The gullet of one shot in the water near the edge of a marsh was so full of small crabs that they fell from the mouth when the bird was picked up. Small crabs and mussels form a considerable portion of the food of this species. I have eaten these birds, but do not care for them often. It is difficult to disguise the peculiarity of flavor.

BLACK BRANT. *Branta nigricans.* All of those which I have examined came from Humboldt Bay, and had been feeding entirely upon "eel grass," or "ribbon grass"—(*Zostera marina*), and were extremely fat.

CALIFORNIA CLAPPER RAIL. *Rallus obsoletus.* In the gullet of a bird shot on a salt marsh, near an artesian well, was a good-sized frog.

NORTHERN PHALAROPE. *Phalaropus lobatus.* A number which were collected from tide pools of a salt marsh had been eating small insects and small worms. Wilson's Phalarope (*P. tricolor*) I have observed catching insects from a muddy surface, actually stalking them in a partially crouching attitude until near enough to dart after them, one at a time.

CALIFORNIA PARTRIDGE. *Callipepla californica.* Two males which I shot one evening, as they were going to roost for the night, after having been feeding on a newly-sown field, contained the following, mainly in the crop: *a.* Two hundred and ten whole grains of barley, six pieces of broken barley, three grains of "cheat," and one of wheat, besides a few barley hulls, some clover leaves and alfilaria. *b.* One hundred and eighty-five whole grains of barley, five broken pieces, four grains of "cheat," and two of wheat; also barley hulls, clover, and alfilaria. The flock numbered nearly or quite twenty birds, and had probably

taken away from that field nearly four thousand grains of barley during that one evening's feeding.

In some parts of California there is a strong prejudice against the quail, owing to alleged damage to the grape. The evidence which I have thus far gathered shows that the quail do pick at the bunches of grapes, and not alone those bunches which are near or on the ground, but the damage which they cause seems over-estimated. Too often, mutilated bunches of grapes are supposed to be due to the presence of quail in the vineyard, but there are other birds and mammals, also, which vary their diet with grapes. I have examined a number of quail's crops and gizzards without finding the presence of grapes, although the birds had been shot near and in vineyards.

A quail's crop sent to me from Los Gatos, by Mr. A. H. Hawley, contained twenty-five small grapes; others had a few grapes, seeds, and poison-oak berries.

Three very young birds of this species contained, besides a few minute seeds, eighteen, twenty-one, and twenty-seven ants respectively. Ants evidently form a large part of the food of the chicks of quails.

The food of quail is mainly small seeds, and at times more or less green food is eaten; clover and the leaves of a species of Baccharis seem to be preferred.

MOURNING DOVE. *Zenaidura macroura.* Small seeds form the principal food of this species according to the crops examined. From one individual collected in Lassen County, I took two-hundred and sixty-seven small pine seeds.

RED-SHAFTED FLICKER. *Colaptes cafer.* Beside the insectivorous food of Picarian birds, the flickers eat largely of poison-oak berries, and I have also found apple in their stomachs.

CALIFORNIAN WOODPECKER. *Melanerpes formicivorus bairdi.* This species is more given to a varied diet than usual with woodpeckers. Besides the fact, which is well known now, that they do eat acorns, various grains are also eaten, and I have known one of these birds to be killed by poisoned wheat put out for ground squirrels. Green corn in the field is eaten and the dry kernels stored away in crevices of trees, as is their practice with acorns.

Several specimens of this woodpecker have been sent to me in the flesh from Visalia, Cal., by Mrs. W. F. Kelsey, in response to my request, as the birds were said to be very destructive to figs. Upon dissection I found the pulp and seeds of figs and nothing else in the stomach. This interesting local instance of injurious habits does not seem to me sufficient ground to justify the destruction of the birds—outside of that orchard. Protection by the use of the shotgun is pretty certain to be enforced by fruit-growers when the actual damage is so evident. I have had marked success in protecting a cherry-tree from the attacks of linnets by suspending a stuffed hawk with out-spread wings over it, and have seen the same plan prove effectual in protecting a soft-shelled almond tree. A stuffed owl is not as effective, acting rather as a "red rag to the bull."

CALIFORNIA JAY. *Aphelocoma californica.* Mr. H. R. Taylor has sent me a corn cob which was entirely stripped of the kernels by jays in Santa Cruz County. Some stomachs collected by Mr. Hawley at Los Gatos contained only barley. Grasshoppers and other insects, principally coleoptera, are the chief dependence of jays, although in a number of instances I have known them to eat acorns and poison-oak berries.

CLARKE'S NUTCRACKER. *Picicorvus columbianus.* At Summit Station Mr. Belding shot one of these birds, from the crop of which I took 130 seeds of *Pinus ponderosa Jeffreyi*, and quite a mass of partially digested seeds was found in the stomach. The crop was so distended that it was very noticeable when the bird was flying.

FLYCATCHERS AND BEES. Mr. A. Barnett, of San Diego County, had 300 swarms of bees which attracted the flycatchers to such an extent that he made some investigations to ascertain to what extent they might be damaging to the bee industry.

Over 100 flycatchers were dissected, principally Arkansas Flycatchers and Phœbes (Black, and Say's?). In all of the Arkansas Flycatchers drones were found, but no working bees, although in many cases the birds were gorged. In most of the Phœbes drone bees were found, the only exception was that of a

Phœbe (Say's?) in which a bee's sting was found in the base of the tongue.

The birds were all shot about apiaries and were seen darting upon and catching the bees. The examinations were made with a hand lens. Mr. Barnett regards the occurrence of the sting found in the Phœbe as accidental and concludes that Flycatchers are beneficial in reducing the number of drones.

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Since the foregoing notes were written I have received an excellent and timely work by Dr. A. K. Fisher on The Hawks and Owls of the United States in their Relation to Agriculture, and which in itself is so complete and conclusive that I may withdraw the meagre notes which I have made upon rapacious birds; they only confirm the conclusions of Dr. Fisher that most of the hawks and owls are far more beneficial than injurious to the agricultural interests of the country. The microscopical examinations, so far as I made, of the contents of the stomachs of the small land birds of California, are vastly in favor of the desirability of protecting them all. A few local instances where actual damage has been done, notably in fruit orchards, must not be taken as a criterion of the value of the species throughout the State and throughout the entire year.

THE HOPKINS SEASIDE LABORATORY.

With Plate xxvi.

BY O. P. JENKINS.

The necessity for seaside laboratories for advancement in biological science has been thoroughly discussed and practically settled.

In Europe the conclusions of this discussion have been more extensively accepted and acted upon than in this country. Within the past twenty years a large number of such stations have been established on the coasts of the various countries of Europe. Of all these the most famous on account of its magnificent equipment both in appliances and in a very complete library, as well as for the grand results which have followed its

establishment, is the Zoological Station at Naples. The success of this great institution is due to the enthusiasm and ability of its founder and director, Dr. Anton Dohrn. This institution has been often described, so that something of its work is very generally known. But it is not well known that in Europe there is a large number of well-equipped and well-supported seaside laboratories. It is from these laboratories that the most important biological work of the present time is issuing.

In our own country the history of the seaside laboratory, while it contains some noteworthy undertakings and bids fair to have a brilliant career, is more briefly told. All naturalists are perfectly familiar with the first notable step in this direction made by Louis Agassiz at Penikese. The natural impetus which came to American biological studies from the inspiration engendered by this movement can never be overestimated. Since the death of Agassiz and the closing the school at Penikese, other very successful laboratories have been maintained on the Atlantic Coast, the results of which have been of great value to biological science. The most important and successful of these thus far have been those of the Marine Biological Laboratory and the Laboratory of the U. S. Fish Commission at Wood's Holl, Mass., and the one maintained by the Johns Hopkins University, which has been moved from point to point. Popular accounts of these have appeared at various times. The Marine Biological Laboratory, under the direction of Dr. Whitman, has been especially successful. It has developed very rapidly into a place where a considerable number of biological investigators with a large number of students assemble every year both for research and elementary study. This station is already regarded justly as a very important one and it contributes largely to the current of biological thought in this country. The commendable ambition of its eminent director, if backed as it should be, and no doubt will be, by proper financial support, will make the station at Wood's Holl even more a center for biological research than it is at present.

With all this activity in biological study pursued by modern methods, there is every reason why the splendid advantages of the Pacific Coast should be made to contribute to the progress of

the work. From the moment that the Leland Stanford Junior University proceeded as far in its organization as to have its first nucleus of a faculty appointed, the biologists of that number began to form plans for the establishing of a marine biological station somewhere on the coast. As soon as time from the work of forming new departments could be secured, Professors Gilbert and Jenkins began a search for the most desirable location for such a station. These examinations were carried on quietly, so that no outside influences might be brought to bear to change the choice of a location; the desire being to select a situation wholly on its merits as a suitable place for such a laboratory.

The points taken into the consideration in this selection were first, the natural advantages, then accessibility; and the facility of getting accommodations at which those engaged in the work could pleasantly and conveniently live.

The present location at Pacific Grove was the result of this selection. When it became public that such an institution was to be located on the coast, expressions indicating the most liberal spirit on the part of towns and citizens were volunteered. This shows that the enterprise has been started in a country where exists an intelligent and liberal people, who will not let it suffer for want of financial support.

The highest hope of those who have undertaken the enterprise was to make a very modest beginning and allow the Laboratory to develop by a process of growth, but with the full faith that the humble beginning would soon lead to a more pretentious development.

As soon as the site was selected, the town of Pacific Grove and the Pacific Improvement Company showed towards the proposed Laboratory a liberality which placed in the hands of the directors sufficient land and a considerable sum of money with which to begin operations. Mr. Timothy Hopkins soon took a great interest in the Laboratory and became its principal benefactor. In recognition of his hearty support and great interest in its establishment, the institution has been christened the Hopkins Seaside Laboratory.

With the financial support thus given it, the directors, last

spring, erected a laboratory consisting of a plain wooden structure of two stories, sixty by twenty-five feet.

It is located on the coast near the railroad station just next to what is known as "The Point," or Point Aulon. On the first floor are two general laboratories for elementary students, a store-room and a library room. On the second floor is a third general laboratory and six private laboratories for investigators. The laboratories, both general and private, are furnished with aquaria, which are supplied with running sea-water. The sea-water is obtained from a source which allows it to be perfectly pure. The water is pumped by a gasoline engine to a tank from which the supply is distributed. The Laboratory is also abundantly furnished with excellent fresh water. The Laboratory possesses a very full supply of glassware and reagents. Whatever is needed in the way of microscopes, microtomes, embedding apparatus, and physiological apparatus is taken from the laboratories of Leland Stanford University for the summer. Of this supply there is a good stock to draw from. The Laboratory also possesses a limited amount of collecting apparatus and two boats.

Monterey Bay being a fishing station of considerable importance renders it possible to make use of many outside advantages for collecting.

The session of last summer was under the direction of Dr. C. H. Gilbert, Professor of Zoology, and Dr. O. P. Jenkins, Professor of Physiology and Histology of Leland Stanford Junior University. They were assisted by Mr. F. M. McFarland, Instructor in Histology, Mr. C. W. Greene, Assistant in Physiology, and Mr. B. M. Davis, Assistant in Botany in the same institution.

Seventeen students were in attendance, representing some half dozen States and several institutions of learning.

The experience of this, the first season, demonstrated clearly enough that the choice of the location is a fortunate one in every way. The forms of plants and animals are wonderfully rich in variety, in the numbers of individuals, in interest, in novelty, and in accessibility. It proves a perfect paradise for the marine biologist. Of course, a single season has only served as a beginning toward opening the gates to the treasures here to be gathered.

The size which some of the forms reach, while of less scientific interest than other of their features, renders them astonishing to those accustomed only to Atlantic forms. A species of Holothurian was brought in three feet in length, jelly fishes two feet in diameter, sea anemones which when open were eighteen inches in diameter, chitons, the giants of their race, twelve inches long, keyhole limpets that would weigh two pounds. Great chains of Salpæ were obtained. The fishes of the bay are of great interest. Among the most common forms are various species of the surf fishes, of great interest from the fact that they bring forth their young alive.

Occasionally the bay is enlivened by the presence of whales, shoals of grampus and dolphins, and seals. But the character of this sketch will not permit an account of the life of the coast at this point, of the interesting land fauna and flora, and the beautiful scenery along the whole coast.

The Hopkins Seaside Laboratory while carried on under the auspices of the University is by no means to be regarded as simply a provision for members of that institution. Its advantages are planned for and freely offered to investigators from whatever source. In this work it is not to be at all looked upon as a rival to any of the well-equipped laboratories already in existence, but rather as a colaborer with them. The field it occupies is both unique and important. It would be a serious neglect of biological opportunities to leave it longer unoccupied. The problems which are now present on this Coast, and those which will open from time to time, will attract investigators from other regions. There is now a home provided for them.

Those of this coast engaged in biological study it is confidently expected will take a lively interest in the work of the Laboratory.

There is no field in science more inviting, nor more promising of large results, than those pertaining to the morphology and physiology of marine forms. The time has certainly arrived when those among us with scientific inclination and ambition can turn their attention with profit to these inviting fields. The work of the Laboratory thus far provides for three classes of people. Naturally students in the biological departments in the

University wish to extend their work in the Seaside Laboratory. They are made welcome. Besides these the Laboratory is open to teachers or those especially interested or prepared to carry on biological study. Especial welcome is given to investigators, those well trained in such work, who have problems relating to morphology or physiology of marine plants and animals which they are capable of working out. Among this class no doubt in time many eminent biologists will take their place. From the association and influence of such a class of men, biological study on the Pacific Coast will receive great gain. The teachers of biological science of the colleges and high schools of the Pacific Slope States should in time find in the Hopkins Seaside Laboratory what those of the Atlantic States find in the Marine Laboratory at Wood's Holl.

It is very obvious that to maintain such a station will require no small sum of money. But such important work and so well begun will not lack support. And most certainly the united moral support of those of the Pacific Coast States who are interested in the advance of science in general, and of biology in particular, may be most confidently counted upon.

THE BOTANICAL WRITINGS OF EDWARD L. GREENE.

BY KATHARINE BRANDEGEE.

It has perhaps not escaped the notice of the botanical world that there is a very great difference of opinion in certain points, especially in the number of species belonging to the Californian flora, between Mr. Greene and his pupils on the one hand and nearly all the remaining Western botanists on the other. Some explanation of the causes of this difference may be of interest.

All of Mr. Greene's work tends to the inordinate multiplication of species, and his species are, as a rule, so imperfectly described that no one without a close acquaintance with the flora or access to the types is able to make out his meaning. It seems to suit his convenience, wherever there is the slightest ground for difference, to at once describe a new species as vaguely as

possible, both as to character and station, and leave to others the unhappy task of finding out whether it is admissible or not. It is a well-known fact that genera and species can be launched with great ease, and that the process of disproving them is onerous and thankless, the more so as the distant investigator naturally defers somewhat to the one who is supposed to have intimate knowledge of the living organism, and possibly to find differences which are masked in the dead one.

Mr. Greene has described "as new" about 700 species, and resurrected something like the same number of groundless synonyms, nearly all relating to the Californian flora, and thus adding to our already inflated list at least 1000 names. It is safe to say that not more than one in ten of these species is tenable, and probably one in fifteen or twenty would be nearer the mark.

In his earlier work, when he submitted his proposed species to the judgment of Dr. Gray or Dr. Watson, the proportion was much better, though the lapse of time and increasing knowledge of connecting forms is dealing hardly with many of those, and he has not escaped the suspicion of deliberately selecting the extremes and ignoring the intermediates.

The underlying reasons of Mr. Greene's devotion to "new species" are not far to seek. The most important one is his attitude concerning their origin. He openly contemns, as inconsistent with the Mosaic record, the theory of evolution held in greater or less degree by almost all biologists, and proclaims his belief in the special creation and the fixity of species, taking occasional opportunity* to sneer at the misguided mortals who differ from him. How this belief affects his botanical teachings is evident at once. Rejecting the clue which would lead him through the tangled labyrinth of overlapping forms which so especially abound in the extreme variation of environment found on the western coast of North America, nothing is consistently left to him but to make a new species of every variation, no matter how trivial. That he has not made five times as many is

* "And if so is it another of that class of facts which our friends the evolutionists press into service, as indicating that species, and even genera, are created by soil, climate, or in one oft-repeated word, environment?"

due to his really, in spite of frequent claims to the contrary, slight knowledge of the forms belonging to our flora, especially in view of the following presentment of his idea of the distinctions of species. "I have long been of the opinion that many species exist in nature for which no specific characters can easily, or even by any known criterion, be found at all in the perfectly developed individual plant; in other terms that completely and thoroughly distinct species may, and in some cases do so closely simulate each other that, with ordinarily good specimens before him, the most acute botanist will fail to be able to separate even as varieties." *

Mr. Greene herein makes it perfectly evident that a species is not with him as with most of us a form of life with characters sufficiently and constantly different from others to admit of a clear description and with a name conveniently expressing relationship, but a distinct entity not necessarily in any close relation to other forms now or previously on the earth and to be hunted to its remotest lair properly labeled and put away on shelf for all time. This kind of botany was taught, probably, in the middle ages to which Mr. Greene properly belongs.

The specific descriptions of Mr. Greene are a disgrace to botany. Even in the few instances where he has named valid species—and in such a multitude it sometimes happens—he uniformly fails to grasp the salient points and mistakes most of the rest. Some of these errors are so gross as to be, for a man holding the position of the author, almost inconceivable, and leave the reader to choose only between deliberate misstatement and an ignorance of methods of scientific study unparalleled in a Professor of botany of a modern university. It is, indeed, to be suspected from his descriptions that, though he can write learnedly of embryological observations made by others, his only method of getting at even the cotyledons of any seed smaller than a bean, is to sprout it. In the very few instances where he has ventured to write about the ovules or embryo, his attempts have been fraught with disaster, as in Viscainoa† for instance, where with a seed of considerable size he described the embryo as

* Pitt. i, 298.

† Pitt. i, 163, 208.

"very small at the base of a copious hard-cartilaginous or almost corneous albumen; cotyledons rounded somewhat convolutely enfolding the short blunt radicle" the fact being that the cotyledons were as long as the seed, and did not enfold anything. Although he had the courage to found a genus upon this plant, he had no conception of its relationship, and sometime subsequently put this near relation of Guaiacum next to Simmondsia, in his list of the plants of Cedros Island.

In declaring Syrmatium* Mr. Greene says: "In restoring this long-neglected genus, I am not obliged to rest it upon those characters alone, sufficient although they would seem to be, which were indicated both by Vogel and by Nuttall a half century ago. The indehiscent pods promptly deciduous at maturity are so utterly and widely unlike those of any *Hosackia* that I suppose the character being here pointed out, there will henceforth remain less excuse than formerly for confounding the genera." Subsequently in working over the genus† he found himself able not only to reduce Syrmatium to Hosackia again, but Hosackia itself to Lotus, remarking that "since the jointed pedicels and deciduous fruiting calyces of, for example, the Lagopus subgenus of Trifolium are not to be of generic import, neither may they be so treated in this group of Lotus which has been called a genus under the name of Syrmatium. The indehiscence of the pods is not at all confined to this group of species. In the very type of the Hosackias and in all its near allies the dehiscence is so tardy that they may about as well be described as indehiscent."

In Pittonia ii, 292, he devotes some space to the fruit of Garrya, which according to his account he has just seen mature for the first time. He is astonished that great botanists like Lindley, Endlicher, and Bentham should have been so greatly mistaken as to consider the fruit a berry "when the first glance at these clusters revealed the fact that the fruit is not baccate, but capsular and the capsule has a circumscissile dehiscence. * * * The circumscission of the capsule is neither very prompt, nor in a geometrically perfect circle, but if tardy and

* Bull. Cal. Acad. ii, 145.

† Pitt. ii, 137.

slightly irregular, it is still an unimpeachably circumscissile dehiscence."

The fruit of Garrya, "pyxis" Mr. Greene calls it, is what is known to most botanists as an "indehiscent berry." It is in fact about as dehiscent and in just the same manner as a gooseberry, Both of them have their tissues strengthened at base and apex and when subjected to violence burst irregularly along the line of least resistance, but if preserved from violence and decay neither of them would "dehisce" in a thousand years. He discourses learnedly concerning *Cicuta Californica* and its root character* but some kind friend having pointed out his blunder he is obliged to admit† that he had mistaken *Œnanthe Californica* for Cicuta and that his remarks do not apply; nevertheless undismayed he proceeds to separate, on root characters alone, three new species from *C. maculata*—he thinks one of them may be *Sium Douglasii*, but not being certain takes his usual and easiest method—makes a new species.

He insists upon dismembering the Compositæ, separating the Cichoriaceæ‡ which he considers more closely allied to the Lobeliaceæ than to their present companions—making the possession of a milky juice of more importance in classification than details of structure. It is a relief to find that he does not drag Asclepias, Papaver, Euphorbia, and the Cow tree into the partnership.

His devotion to archaic botany seems to interfere somewhat with a due regard to contemporary literature, as, for instance, in his lengthy account of Carpenteria, § where he made the rest of the world aware that he thought a plant in quite common cultivation was still known only in the type specimen; in his rather frequent homonyms and in such instances as *Eriogynia Hendersoni*‖ and *Cnicus heterolepis*,¶ both of which he redescribes, being "unable to find that any description was ever published," though the first appeared in the *Botanical Gazette* for 1891, and the second (under Cirsium) in *Plantæ Hartwegianæ*.

* Pitt. i, 271.

† Pitt. ii, 6.

‡ Pitt. i, 298. Erythea, i, 1.

§ Pitt. ii, 67, 141.

‖ Pitt. ii, 219.

¶ Proc. Philad. Acad., 1892, 363.

Mr. Greene's memory is apparently often at fault in such trivial matters as may involve the giving of credit to others, especially to those who have rendered themselves obnoxious by presuming to differ from him. A few instances have already been pointed out.* Among more recent lapses may be mentioned the rediscovery† of *Sanicula maritima* by Miss E. Cannon. Mr. Greene not long ago gave an account of it and its only known locality, ‡ but in "Flora Franciscana" writes of it as if it were not uncommon, and makes no mention of the recent collector.

That he should remember to quote his neighbor's synonymy and forget his own is perhaps quite natural, but it may have a misleading effect upon the "tyro," whom he so frequently mentions. *Cleome Isomeris* Greene of Pittonia i, 200, does not reappear in "Flora Franciscana," neither do the various species of Atenia, of which he is the author, and of *Trifolium triflorum* no trace appears.

The author of a local flora is supposed to have a good acquaintance with the plants of his region, but Mr. Greene's knowledge of "his own western hills" is not by any means exhaustive, judging by the three parts of "Flora Franciscana" now issued. A few examples taken at random from the multitude may suffice. He evidently did not know that *Roubieva multifida* covers large areas in San Francisco, and is widespread about the interior towns; that *Chorizanthe polygonoides* grows at a convenient walk from his door; that *Silene multinervia*, *Calandrinia Breweri*, *Claytonia parvifolia*, *C. diffusa*, and *Astragalus Breweri* abound on Tamalpais; that *Cypselea humifusa* and *Glinus Cambessideus* share the muddy margins of pools with "Biolettia;" that *Crantzia lineata* abounds along the river and slough banks from Antioch to Port Costa; that *Cleome integrifolia* is abundant a few miles below Monterey; that *Abronia villosa* is found in the valley of the San Joaquin at least as far north as Alcalde; that *Lotus stipularis* "seldom seen" is common on ridges of Tamalpais and on Redwood Peak in his immediate neighborhood; and that *Euonymus occidentalis*, "apparently one of the rarest

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* Proc. Cal. Acad., ser. 2, i, 259. Zoe, ii, 80.

† Zoe, ii, 95.

‡ Pitt., i, 269.

of our shrubs," is found in every deep, shady ravine of Tamalpais. By his two synonyms he has made it sufficiently evident that he never saw the red-berried elder, although it grows in Wildwood Glen at Sausalito, and is quite common all about Marin County. By his own confession he has just seen for the first time ripe fruit of a Garrya, although two species fruiting abundantly help to make the thickets covering Tamalpais, and he has written, as of distant plants, pages in his usual didactic style, attempting to convince the world that the black- and the amber-fruited forms of *Ribes aureum* are two distinct species, ignorant of the fact that Dr. Kellogg long ago reported it as growing in "Redwood Cañons, back of Alameda," and that it fruits abundantly in both forms in San Antonio Valley, back of Mt. Hamilton, and with no more reason for division than *Ribes spectabilis*, which fruits with similar diversity at Point Reyes.

His descriptions in "Flora Franciscana" are usually quoted, and the attempts at critical work are of the weakest—as for instance where dealing with species well known to him in the living state, he calmly inserts into his flora *Vicia gigantea* and its strict synonym *Lathyrus cinctus*, and *Lupinus cervinus* with its second name *L sericatus*.

But it is when Mr. Greene enters the field of bibliography and attempts to fix the dates of genera and species that his work stands forth unrivaled. As long as he confines himself to copying from the pages of Pritzel, Jackson, etc., and from Watson's Index he is tolerably secure, but when grown bolder he cuts himself loose and starts on his wild career alone, then chaos comes again.

Everyone knows that the dates given on the title page of many of the botanical books even as late as forty or fifty years ago are inaccurate. The importance of exactness was yet little felt, and priority was not so much regarded. Between the years 1830 and 1846 three English works of much importance to our flora, were published. These were Flora Boreali-Americana in two volumes, Botany Beechey, and Botany of the Sulphur. The first bore on title page the date 1840; the second 1841; and the third 1844. The last concerns us at present but little and may be dismissed with the statement that it was evidently

antedated as it quotes the London Journal of Botany for 1845 and De Candolle's, Prodromus, vol. ix, also of 1845.

The two first were apparently printed nearly simultaneously. They alternately quote from each other beginning with the California part of Botany Beechey, and continuing in something near the same order to the end.

Mr. Greene adopts ostensibly the dates given in all the lists, 1833 for the first volume of Flora Boreali-Americana; 1840 for the second volume and 1840 for the whole of Botany Beechey.

The internal evidence shows that these two publications were printed in irregular parts or signatures at irregular intervals. Flora Boreali-Americana, is quoted in Don's Dichl. Plants, commencing near the beginning of vol. i, dated 1831, and as Don's volumes are of 700 or 800 4to pages, which, on account of the precision required, would take a long time to print, the evidence is sufficient to show that the first parts of Flora Bor.-Am. must have been printed, and to a certain extent distributed early in 1831. These books all followed the same classification, which interferes considerably with the definiteness of dates. Vol. i of Don quotes to Violaceæ; Vol. ii, 1832, quotes as far as its classification goes—page 214 of Flora Boreali being about the last.

Flora Boreali-Americana commences on page 247 to quote Botany Beechey, page 124.

In the light of these data the following dates affixed to the species by Mr. Greene will show how little he is to be trusted, and what a hopeless muddle he has made of the whole matter. They are copied unless otherwise stated from his Flora Franciscana.

Anemone deltoidea,	Flor. Bor.-Am. i,		page	6 (1829).
Pæonia Brownii,	"	"	"	27 (1829).
Erysimum capitatum,	"	"	"	38 (1829).
Physaria didymocarpa,	"	"	"	49 (1829).
Cakile edentula,	"	"	"	59 (1830).
Hesperis Menziesii,	"	"	"	60 (1830).
Platyspermum scapigerum,	"	"	"	68 (1829).
Thysanocarpus curvipes,	"	"	"	69 (1829).
Cleome lutea,	"	"	"	70 (1830).

Viola sarmentosa,	Flor. Bor.-Am. i,		page	80 (1833).
Psoralea physodes,	"	"	"	136 (1830).
Astragalus lentiginosus,	"	"	"	151 (1830).
Vicia gigantea,	"	"	"	157 (1830).
Cerasus emarginata,	"	"	"	169 (1830).
Spiræa Douglasii,	"	"	"	172 (1830).
Œnothera Boothii,	"	"	"	213 (1833).
Hosackia tomentosa,	Bot. Beech.		"	137 (1836).
Adenostoma fasciculatum,	"	"	"	139 (1840).
Œnothera alyssoides,	"	"	"	340 (1840).
Godetia lepida,	"	"	"	342 (1836).
Gaura decorticans,	"	"	"	343 (1840).
Œnanthe (*Helosc.*) *Californica*,	"	"	"	142 (1840).

As if this kind of thing were not ridiculous enough he gives the following:

"*Sanicula arctopoides* H. & A.; Hook. Fl. i, 258 t. 90 (1833); Bot. Beech. 141 and 347 (1840)."

"*Sanicula Menziesii* H. & A.; Hook. Fl. i, 258 t. 90 (1833); Bot. Beech. 141, 347 (1840)."

As both of these species are quoted on page 258 of Flora Bor.-Am. from 'Hook. et Arn. in Bot. of Beech. Voy. p. 141" for the first and page 142 for the second species, Mr. Greene deliberately commits himself to the theory that Hooker in Flor. Bor.-Am., published in 1833, was able to prophesy on what page of a work published seven years later a given species would appear.

Rees' Cyclopædia is in thirty-nine volumes of text with several of plates. Every one of the volumes of text bears on its title-page the date 1819. They follow each other in the order of the alphabet, and are not paged. Mr. Greene appends certain dates to the species quoted. How he arrived at them he can best explain. The following are examples. The words in brackets are by the writer:

Achlys triphylla Smith, Rees' Cycl. (1812?) under *Leontice* [vol. xx].

Phaca densifolia Smith in Rees' Cycl. (1819) [vol. xxvii].

Ribes malvaceum Smith Rees' Cycl. xxx (1815).

Ribes ferox Smith Rees' Cycl. xxix (1815).

Ribes stamineum Smith Rees' Cycl. (1815). [Smith's paper on Ribes is eight pages in length, and entirely in Vol. xxx.]

Viola adunca Smith Rees' Cycl. (xxxvii) 1817.

These are but examples of numerous others, a few of which will be noticed in subsequent pages, and yet, Mr. Greene, as is well known, poses as bibliographical purist, and is remarkably fond of pointing out the shortcomings of others in this respect.*

The genera proposed by Mr. Greene are, with the notable exception of "Biolettia," founded on sections of other authors, on aberrant species to which attention had been called by others, or as substitutes for older names which he considers untenable. The changes made by the resurrecting of synonyms and the rejection of homonyms are of much greater extent and made as most of them are without judgment or sufficient research have inflicted an appalling synonymy upon the Flora of California.

The principal generic changes so far made or adopted by Mr. Greene in his Flora Franciscana and other papers, are:

Clematitis L. instead of *Clematis* L. This is one of the changes in which Mr. Greene follows Otto Kuntze. It is effected by taking as the Linnean date the first edition of the Systema Naturæ, two years earlier than the period commonly received. The additional syllable in the name seems the only thing to be gained by this transfer.

Kumlienia, Greene founded on *Ranunculus hystriculus*, principally on the utricular akenes, though they are hardly more utricular than in *R. Nuttallii* or even in the common *R. Cymbalaria*.

Chrysamphora, Greene for *Darlingtonia* because there is an older Darlingtonia in synonymy. As, however, the "once a

* The latest of these diatribes is to be found in "*Erythea*" for May, 1893, where the author, in the course of "damning with faint praise" Professor McMillan's Metaspermæ of the Minnesota Valley, says, "We might have expected much of bibliographical laxity and inaccuracy in any author who could speak of Watson's Index as being a book 'remarkably exact.'"

synonym always a synonym" rule has not been adopted as yet by any considerable number of botanists no one need be in haste to discard the well-known name. It must not be forgotten that many generic names are retained in deference to usage, though hardly considered valid, and that if change is insisted upon some at least are likely to be merged in their nearest neighbors. The differences between Darlingtonia and Sarracenia are very slight.

Alsinella Dill. is taken up for *Sagina* L. in violation of all botanical rule.

Tissa Adans. is adopted instead of *Spergularia*, *Lepigonum* or *Buda*. The best way out of this tangle is, in the writer's opinion, to remand the few valid species to *Spergula* from which some of them can hardly be distinguished.

Bursa L. for *Capsella* Moench. If the proposition emanating from a group of German botanists, and adopted by the botanical section of the American Association, meets with general acceptance this change will not be required.

Heterodraba Greene is *Draba unilateralis* Jones. It differs in habit, but not in technical character from other Drabas. It is a singular botanical judgment which sustains Heterodraba and Tropidocarpum, while reducing Stanfordia to Caulanthus.

Athysanus Greene was founded on *Thysanocarpus pusillus*. The author seems never to have been able to get at the details of its structure. The depauperate strap-shaped petals, and membranaceous filaments widened toward the base are as in *Draba unilateralis*, but the pod, which in San Francisco specimens is often destitute of hooked hairs, is constantly 1-celled, 4-ovuled and 1-seeded. The Cruciferæ are badly in need of a general revision. In their present state no botanist adds to his credit by proposing new genera among them.

Hesperalcea Greene is one of Dr. Gray's section names raised by Mr. Greene to generic rank. As Sidalcea is itself becoming much weakened it would seem hardly necessary to erect one of its species into a separate genus.

Toxicodendron L. for *Rhus* L. A Systema name.

Lotus L. for *Hosackia* Benth. With this we agree.

Xylothermia Greene for *Pickeringia* Nutt. On the "once a

synonym always a synonym" plan. The fruit of Pickeringia seems to be so far unknown and may alter its place in classification. The pod is from 1½ to 2½ inches, 5–9-ovuled, 2–4-seeded, flattened, constricted between the seeds, but not jointed, dehiscent along the ventral side; seeds with thin foliaceous cotyledons, and rather abundant endosperm.

Viscainoa Greene had long been known as *Staphylea? geniculata* Kell. Everyone knew that it did not belong to Staphylea, but as only old fruiting specimens were known, no one but Mr. Greene ventured to give it a new name. It is one of a series of monotypic or restricted genera all very near Guaiacum.

Mr. Greene divides Prunus into Cerasus, Prunus, and Amygdalus; adopts Sorbus instead of Pyrus and separates Malus. All this has been done before and rejected.

The separation of Spiræa into a half dozen or more genera will commend itself to such botanists as appreciate very fine distinctions and take pleasure in a complicated synonymy. One of these genera, *Eriogynia*, deserves some notice. Mr. Greene says:

"I had long suspected that Bongard's paper on the vegetation of Sitka, read in the St. Petersburg Academy on the fourth of May, 1831, must have been printed and distributed before 1833; in which case it would antedate much of the first volume of Hooker's Flora. Dr. Otto Kuntze's careful and extensive researches into bibliography have brought forth the fact that Bongard's paper was indeed distributed before the end of 1831. It is therefore inevitable that LUTKEA must displace Eriogynia."*

Otto Kuntze as his authority for the earlier date of Bongard says that, according to a statement of De Candolle, Bongard's paper had been already noticed by him in 1831.

It has already been shown on a previous page that a large part of the first volume of Hooker's Flora, Bor–Am. was quoted by page and plate in volumes issued in 1831 and in 1832.

It is a fact which seems to have escaped the notice of Mr. Greene, that contemporary botanists, even those who would apparently be the first to know, make no such claim; for instance, Walpers Repertorium ii, 53, published in 1843, quotes Bongard

* Pitt. ii. 219.

Pyrus diversifolia as a synonym of Hooker's *P. rivularis*, Flor. Bor-Am. i, 303.

Maximowicz, of St. Petersburg, who might be supposed to know the date of a Russian work, says in Adn. de Spiræaceis: "Names [Eriogynia and Lutkea] by Hooker and by Bongard published in the same year, the latter perhaps earlier, but Hooker's preferred because the specific name is correctly given."

Osmaronia Greene for *Nuttallia* T. & G. "Once a synonym always a synonym." Nuttallia is, however, easily reducible to Prunus.

Kunzia, Spreng for *Purshia* DC. for the same reason.

Micrampelis Raf. for *Echinocystis* T. & G. Rafinesque's names should not be received until his diagnoses are republished. Many of his papers are almost inaccessible, and before submitting to the changes involved in the restoration of his names, the botanical world should have the means of judging whether they deserve to be resurrected or not. Mr. Greene is notoriously partisan, and a strong partisan is never a just judge.

Osmorrhiza Raf. is reduced to *Myrrhis* Moris. The former is as good a genus as most of those at present accepted in the family. Any reduction in their number is, nevertheless, to be welcomed.

Lilæopsis Greene for *Crantzia* Nutt. "Once a synonym," etc.

Caprifolium L. for *Lonicera* L. Systema name.

Obolaria Sieg. for *Linnæa* Gronov. Before the Linnean date.

Trichocoronis Wrightii, Gray, a small Eupatoriaceous plant now becoming naturalized in California having been discovered by one of Mr. Greene's pupils, was described by him as a new genus and species *Biolettia riparia*, Greene, which according to him "has the aspect of a small Erigeron but with fruit characters of the Helenioideæ * * * suggests at once Eclipta and Spilanthes." Having had his error corrected by the writer* he after the lapse of a year attempts to evade the matter in the following way, which at the least can hardly be encouraging to any one wishing to believe the author's blunders to be inadvertent.

"TRICHOCORONIS a small group of flaccid riparian herbs, though perhaps best placed here, imitates *Erigeron* of the next

* Zoe ii, 301.

tribe in general aspect, and lacks even the clavate style-branches of this one, these organs being nearly linear and even somewhat compressed, rather than terete and claviform. Although the type of the genus has pentagonal achenia and a coroniform concreted pappus, a newly discovered Californian ally of it displays exactly quadrangular akenes surmounted by distinct and conspicuous pappus paleæ and equally distinct bristles alternating with them. This I have published as a genus *Biolettia*; and, with authors who, like Bentham and Asa Gray, make much of this kind of character, allowing it to overbalance all considerations of agreement in habit, *Biolettia* will be received in generic rank. But, as the type is a *Trichocoronis* in *facies* I now prefer to treat it as an aberrant member of that genus, and rename it:

TRICHOCORONIS RIPARIA. Biolettia riparia, Greene, Pitt. ii 216."*

Mr. Greene should call this kind of thing Comical Notes instead of "Critical Notes." "Biolettia" has been distributed to a considerable extent and any one who has a specimen may see for himself that the style branches are terete and somewhat thickened upward, and that the pappus is exactly what Dr. Gray describes "a minute but evident crown of more or less concreted setuliform squamellæ or some of them aristellate." The akenes are always pentagonal though the faces are unequal. Bentham and Hooker say "In specie altera (*T. Wrightii*) styli rami subteretes et pappus conspicuus, in altera (*T. rivularis*) styli rami supra medium complanati et pappi pili minuti."†

The plant has just the appearance of a small pale Ageratum and the attempt to liken it to Erigeron is an unworthy evasion of the fact.

It has been compared at Harvard with the type of *T. Wrightii* and found to be exactly the same.

Coleosanthus Cass. for *Brickellia* Ell. Although Mr. Greene evidently doubts the sufficiency of the characters separating Brickellia from Kuhnia, he nevertheless supplements Dr. Kuntze by transferring a few additional species. Baillon reduces Brickellia

* Erythea i, 41.

† Genera Plantarum i, 241.

to Eupatorium. Bentham says "Genus Kuhniæ quam maxime affine." Until these questions had been settled we might have been spared the synonymy.

Blepharipappus Hook. Fl. Bor-Am. i, 316, for *Layia* Bot. Beech. 148. Mr. Greene gives the synonymy of this genus, according to his idea, on page 245 of the second volume of Pittonia. He there entirely overlooks the naming of Layia which occurs on page 148 of Botany Beechey, giving reference only to the later page where it is found. It is possible that Blepharipappus is a trifle earlier than Layia, but so far as we now know the fact cannot be established. The volumes were published so nearly at once and quote each from the other in so irregular a manner that the internal evidence leaves the reader in doubt. It is certain that page 142 of Botany Beechey was printed before page 255 of Flor. Bor-Am., for the latter, there quotes from the former. On the other hand it is equally apparent that page 295 of Flor. Bor-Am. was printed before page 146 of Bot. Beechey. On the whole it appears to have been entirely unnecessary for Mr. Greene to transfer the species, even though by so doing his name is made to follow all but one of the new combinations.

Hazardia Greene of a single species amplified to three by the author, did not require the generic name.

Ereminula Greene is substituted for *Dimeresia* Gray, because of previous names, "Dimeria" "Dimesia" "Dimetia" and "Dimeresa." Following such rule, Crockeria might be in danger from the earlier "Krockeria."

Agoseris Raf. for *Troximon* Nutt. The attempt to bring this name into use is an outrage. It occurs on page 58 of Flora Ludoviciana in the concluding sentence of Rafinesque's description of the fictitious *Troximon odoratum* Raf. founded on Robin's '*Chicoracée fenouillette*' and is as follows: "This species together with *Tr. virginicum*, *Tr. pallidum* and *Tr. bulbosum* will form the genus Troximon, the other species which are acaules and with an embricated [!] calyx must form a peculiar genus which I shall call Agoseris." No type species is indicated and no one can be certain of what plants Rafinesque had in that store-

house of vagaries known as his mind. Mr. Greene, however, transfers all the species, attaching his name to every one.

This certainly is not held by reputable naturalists as valid publication of a genus, and Mr. Greene, by failing to reprint the "generic character," lays himself liable to the suspicion of a deliberate attempt to deceive.

Nemoseris Greene for *Rafinesquia* Nuttall, "once a synonym." Rafinesquia is not considered a valid genus by either Bentham & Hooker, or by Baillon.

Ptiloria Raf. for *Stephanomeria* Nutt. Such weak genera as this will hardly bear the strain of a set of synonyms; it is much too near Lygodesmia. Baillon reduces it to Lactuca.

Psilostrophe DC. for *Riddellia* Nutt. This is an older name, apparently, for the same genus. Dr. Kuntze and Mr. Greene have transferred the species independently, and those who append the names of the authors of combinations may have some trouble with their priorities.

The various genera into which Mr. Greene divides Microseris, etc., are not recognized nor are they likely to be.

Bolelia Raf. for *Downingia* Torr. will cause very little trouble either way.

Solanoa Greene for *Schizonotus* Gray which has already been reduced by different authors to neighboring genera.

Clevelandia Greene though very near Orthocarpus was considered a valid genus by Dr. Gray.

Lappula Moench will probably have to be substituted for *Echinospermum* Lehm.

Adenostegia Benth. is of course the older name for *Cordylanthus*.

Audibertia Benth. is reduced to *Salvia* L. with which it is thoroughly confluent; but Mr. Greene, giving an extraordinary description of the corolla of *Audibertia polystachya*, confusing the bud and the flower, makes it the type of a new genus "Ramona."

Lepargyræa Raf. for *Shepherdia* Nutt. Mr. Greene will have to make a better showing for this genus than he does* if he seriously desires the change. He gives sufficient extracts from

*Pitt. ii, 121-122.

Rafinesque to convict the latter either of deliberate falsehood or of eccentricity bordering on madness.

Tumion Raf. for *Torreya* Arn. In order to make this change Mr. Greene would displace Synandra of the Labiates, by an earlier Torreya of Rafinesque, and thus render Arnott's Torreya unavailable for the Coniferous genus.

Razoumofskya Hoff. for *Arceuthobium* Bieb. Let us hope that research may find a less hideous name available for our pine mistletoes.

Unifolium for *Smilacina* Desf. In order to have the pleasure of using this name for our very leafy Smilacinas we are to reduce them to Maianthemum and then take an older name for for that genus. Otto Kuntze would have us adopt Necker's Tovaria. There are certain botanical works which though dealing with systematic botany are usually ignored. Necker's "Elementa" might with very good reason be added to the list. He begins by dividing all known plants into fifty-four "Natural Genera" and groups the genera of other botanists under each "Genus" as species. The only indication as to whether his "species" are original or otherwise is given near the end of the third volume by his index of "Species Naturales Botanicis ignotæ, quibus nomina Neckeriana accommodantur," in the 400 or so names of which there may be found plenty of material for unsettling genera.

The new species proposed by Mr. Greene have, in most cases when critically examined, failed to receive the approval of competent botanists, and they appear to suffer in direct proportion to the examiner's familiarity with the Californian Flora.

Dr. Gray died before Mr. Greene was fairly launched in his species-making and before the collecting of variations had made more than a beginning, nevertheless he, in the supplements to his Synoptical Flora, reduced the following species:

Pentachæta aphantochæta	*Lessingia nemaclada*
Pentachæta paleacea	*Corethrogyne detonsa*
Bigelovia rupestris	*Erigeron angustatus*
Bigelovia tridentata	*Helianthella Nevadensis*
Lessingia Parryi	*Madia Rammii*
Lessingia adenophora	*Hemizonia Lobbii*

Hemizonia hispida
Hemizonia spicata
Hemizonia oppositifolia
Layia graveolens
Blepharizonia laxa
Lasthenia Coulteri
Hymenopappus robustus
Senecio Austinæ
Senecio ammophilus
Senecio Layneæ
Senecio Howellii
Hieracium brevipilum
Nemacladus capillaris
Nemacladus montanus
Nemacladus pinnatifidus
Nemacladus pubescens
Nemacladus tenuissimus
Asclepias pinifolia
Gilia heterodoxa
Krynitzkia Cedrosensis
Krynitzkia cycloptera
Convolvulus fulcratus
Chamæsaracha physaloides
Antirrhinum Kelloggii
Pentstemon Kleei
Pentstemon pauciflorus
Mimulus acutidens
Mimulus barbatus
Mimulus Hallii
Mimulus inodorus
Mimulus microphyllus
Eunanus Breweri
Eunanus Layneæ
Plantago Californica

Prof. C. S. Sargent in his magnificent "Trees of North America," reduces every one of Mr. Greene's species occurring thus far in the work of which four volumes are now published. They are *Rhamnus insularis*, *Rhamnus rubra*, *Ceanothus arboreus* (retained as a variety), *Cerasus Californica*, *Lyonothamnus asplenifolius*, *Amelanchier glabra*, *Amelanchier pallida*. *Ptelea crenulata* is not even mentioned. Besides these all the species revived from synonymy by Mr. Greene are reduced.

Rev. Thomas Morong revising in Bull. Torr. Club xv. the American Typhaceae reduces the species of Mr. Greene, *Typha bracteata* and *Sparganium Californicum*, belonging to that order.

Prof. William Trelease has also reduced the species of Rhamnus, as well as of Epilobium.

C. F. Millspaugh in Pitt. ii, 82-90 considers *Euphorbia Neo-Mexicana* and *E. rugulosa* Greene to be merely varieties of *E. serpyllifolia* Pers.

The species of Astragalus proposed by Mr. Greene have been recently studied from the types, and the notes upon them appear in pages 22—33 preceding.

The descriptions of the species hereinafter enumerated are in most cases to be found either in the series of papers issued by

Mr. Greene under the name of "Pittonia" or in his "Flora Franciscana." The references of the few exceptions are given. No attempt has been made to verify all of the species. To do so would, in many cases, necessitate the partial revision of large genera and the study of priorities, involving an amount of time not now at the disposal of the writer. For these reasons the two score new species and the various genera "instituted" within the limits of the old genus Eritrichium and the numerous species of Delphinium, Trifolium, Potentilla, Erigeron, Cnicus, Senecio, Microseris, etc., are here neglected, as well as many of the of the Cruciferæ. Fortunately for the interests of science the larger number of the types are in the herbarium of the California Academy of Sciences. The later ones are being mounted and rendered accessible in the herbarium of the University of California at Berkeley, and if the notes given under the species seem to bear hardly upon the capacity or the judgment of Professor Greene, the means of proof or disproof are in most cases at hand.

Thalictrum cæsium Greene is apparently *T. polycarpum* Wats., but that species is so near *T. Fendleri* that it is uncertain to which it had better be referred.

Thalictrum hesperium and *C. playtycarpum* Greene are forms of *T. Fendleri* Engelm. Mr. Greene keeps the name up, although he says it "seems almost or quite confluent with *T. Fendleri* of the southern Rocky Mountains."*

Ranunculus Bolanderi† Greene is, according to Dr. Gray, typical *R. alismæfolius* Geyer.

Ranunculus Biolettii Greene is *R. pusillus* var. *Lindheimeri* Engelm. It has been collected by the writer at Folsom, and about ponds near Olema, where it is common, it is often a foot or more in length.

In Flora Franciscana Mr. Greene describes *R. pusillus* Poir, and remarks: "Rare in California, though common in the southern Atlantic States; found in Napa Valley, *Bigelow*, and in Marin Co., *J. P. Moore*. The akenes are either smooth or rough in even the eastern plant, so that the designating of ours

* Fl. Fr., 310.

† Bull. Cal. Acad. ii, 58.

as a variety seems unwarranted." This was published in April, and in the following month he described the species, from plants collected near Bigelow's Station, as *Ranunculus Biolettii.* Dr. Gray, in his last revision, calls the plant *R. pusillus* var. *Lindheimeri.* It is *R. trachyspermus* Engelm, var. *Lindheimeri*, but there was an older *R. trachyspermus.* Dr. Gray implies that *R. Bonariensis* Poir and *R. fontanus* Presl. are too nearly related to it, so also is apparently *R. humilis* H. & A.

*Ranunculus Ludovicianus** Greene is *R. Californicus*, var. *latilobus* Gray. The type was collected by the writer.

Ranunculus maximus † Greene is *R. orthorhynchus* var. *platyphyllus* Gray. It is rather common in Marin County and has been collected by the writer at Ager, near the Klamath River. The extremes of its foliage are much less than are shown between such forms of *R. Californicus* as the prostrate plants with thick, hardly divided leaves, at Point Lobos, and the slender, erect ones with very finely divided foliage, which grow about Castroville.

Ranunculus alismellus Greene is *R. alismæfolius* var. *alismellus* Gray.

Ranunculus rugulosus Greene is evidently a mere form of *R. Californicus* Benth.

Ranunculus ellipticus Greene. In Pitt. ii, 110, this is described as "a widely dispersed and often collected for western species, which has long been wanting specific definition," and shortly after in Flora Franciscana it is reduced to *R. glaberrimus* Gray.

Ranunculus subsagittatus Greene was raised in rank from *R. Arizonicus* var. *subsagittatus* Gray, in Pitt. ii, 59, where he remarks that "*R. Arizonicus* looks a good deal more like the ordinary Rocky Mountain *affinis* than does the preceding." On page 110 following he admits having jumbled the species and reduces his *subsagittatus* in consequence.

Ranunculus Turneri Greene is apparently *R. lasiococcus* Ledeb.

Berberis pumila Greene is *B. repens* Lindl. and the earliest specimen so labeled was from Mt. Hanna in Lake County.

Vancouveria chrysantha Greene is *V. hexandra*, M. & R.

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* Bull. Cal. Acad. ii, 58.

† Bull. Torr. Club, xiv. 118.

Argemone corymbosa Greene is *A. platyceras* Link & Otto. It was found about a railway station on the Mojave Desert and has been only once collected.

Papaver Lemmoni Greene is *P. Californicum** Gray.

Mr. Greene refers *Meconopsis heterophylla* to Papaver and copies the incorrect reference of Bot. Calif. to the plate number of Hooker's Icones.

Platystigma (Meconella) denticulatum Greene is *Platystemon Oreganus* (Nutt.)

Dendromecon flexile† Greene is *D. rigidum* var. *Harfordii* (Kell.)

Platystemon crinitus Greene is *P. Californicus* Benth.

Eschscholtzia Austinæ, glyptosperma,‡ *Mexicana,*§ *peninsularis,*|| *rhombipetala, elegans,*¶ *ramosa,*** Parishii,†† *maritima, modesta, tenuisecta, leptandra, Lemmoni,*‡‡ *ambigua* Greene are unnecessary additions to the synonymy of the genus, all possible species having been already amply provided for in previous synonyms. In Flora Franciscana, perhaps having reason to fear that his *E. glauca* was in danger of being mistaken for a half dozen other species, he provides it with a new and striking character—"Species exceedingly well-marked by a certain not well-definable grace of its very beautiful white-glaucous foliage." The phrase is so inimitable that one regrets to disturb it, but judging by the type specimen the "white-glaucous" part is a mistake.

Nasturtium occidentale Greene is *N. curvisiliqua* (Hook.). The statement that the pods are "flattened contrary to the partition" is misleading, the partition being nearly as broad as the valves.

Nasturtium dictyotum Greene. This exactly matches specimens of *N. sessiliflorum* Nutt. and other specimens current as *N. palustre* DC.

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* Zoe, ii, 121.
† Bull. Torr. Club, xiii, 216.
‡ Bull. Cal. Acad. i, 70.
§ Bull. Cal. Acad. i, 69.
|| Bull. Cal. Acad. i, 68.
¶ Bull. Cal. Acad. i, 182.
** Bull Tor. Club xiii, 217.
†† Bull. Cal. Acad. i, 183.
‡‡ W. Am. Sc. 157.

Cardamine cardiophylla Greene as well as the revived synonyms *C. integrifolia* (Nutt.) and *C. Californica* are all apparently forms of the varying *C. paucisecta* Benth. *C. cuneata* Greene known only in immature specimens may belong here also, but the foliage is more dissected. *C. integrifolia* (Nutt.) is apparently the oldest name.

Streptanthus Parryi Greene is *Caulanthus Lemmoni* Wats., the older name.

Streptanthus niger, peramœnus, albidus, barbiger, Biolettii, pulchellus, Mildredæ, and *secundus* Greene are nearly all separated by inconstant characters from *S. glandulosus*. Watson in one of his later papers reduced *peramœnus* and *albidus; pulchellus* and *secundus* are the same thing from the same locality.

*Thysanocarpus ramosus** Greene is *T. elegans* F. & M.

Cerastium grande Greene is certainly *C. maximum* Ledeb.

Silene purpurata Greene, by the description, seems to be *S. repens* Ledeb.

Silene simulans Greene is *S. laciniata* Cav.

Alsinella ciliata Greene is *Sagina apetala* L.

Paronychia pusilla Greene is *Herniaria cinerea* L. another waif from the Mediterranean region. A second species *H. glabra* was collected by Mr. Congdon, near Darrah, in Mariposa County, some years ago. Mr. Greene might be forgiven for renaming the obscure weeds which make their advent into California if he would but acquire the knowledge necessary to place them in the proper genera.

Tissa pallida, T. leucantha, T. Talinum† & *T. valida*† Greene are forms of that species of which the oldest name is, apparently, *macrotheca*. *T. Talinum* and *T. valida* are perfectly inexcusable.

Tissa Clevelandi Greene is *rubra*, the perennial form.

Tissa tenuis Greene is *Lepigonum gracile* Wats. and both are probably referable to *diandra* and perhaps to still older names. The type of *tenuis* was collected at Alameda and Dr. Kellogg collected it at the same place more than ten years earlier. It often has four stamens, and is perhaps never truly apetalous; like *gracile* it has from one to four small, obovate, hyaline petals

* Bull. Cal. Acad. ii, 390.
† Eryth. 106 and 107.

usually entirely obscured by the broad hyaline margin of the sepals. It is very common in sandy places in California and runs into many forms, as diverse in the size of petals and the markings of the seeds as any other species. Bentham & Hooker are probably right in considering the numerous species reducible to three or four, and so far at least as California is concerned all our forms are European, and either introduced or common to maritime shores.

Viola pinetorum Greene, is reduced by the author to *V. purpurea* Kell. It was described as "having truly violet colored petals; all other known species of the group being yellow-flowered." In Flora Franciscana, however, he reduces it without explanation to the yellow-flowered *V. Nuttallii.*

Viola Douglasii Steud. is substituted for *V. chrysantha* Hook. on account of an older homonym; then as Philippi has named another species (from Chili) *V. chrysantha*, Mr. Greene furnishes that also with a new name, *V. Philippiana.* All this without troubling himself in the slightest degree about the validity of the species involved, and apparently without taking the trouble to notice the previous *V. Philippii* Leyb.

Calyptridium (*Spraguea*) *nudum* Greene is a condensed subalpine form of *Spraguea umbellata* Torr.

Claytonia nubigena Greene is a common form of *C. perfoliata* Donn.

Sidalcea tenella Greene is *S. Hartwegi* Gray.

Sidalcea secundiflora Greene is a variety of *S. diploscypha* Gray.

Sidalcea campestris Greene is founded on the sterile (male) plants of, apparently, *S. Oregana* Nutt.

The perennial species of Sidalcea are certainly not nearly so numerous as has been supposed. Long suites of specimens from many localities show that the differences relied upon as specific are far from constant. Even the generic type is becoming much weakened by forms in which the double series of anthers is much less evident. It is remarkable that Sidalcea should have been considered beakless when nearly every species is beaked more or less strongly. Mr. Greene, who has probably never seen the

figure in Ic. Mex. Ined.* on which the species was founded, transfers the name *S. malvæflora* (Moç. & Sesse) to what has been of late called *S. Neo-Mexicana* Gray and takes up *S. delphinifolia* Nutt. for the common species of the coast of California. From his remarks he appears to think that the original *S. malvæflora* was glabrous, whereas the drawing shows it to have a copious spreading pubescence.

Erodium Californicum Greene was brought from Santa Cruz Island by Mr. Brandegee in 1888. It seems to be only a rank and vigorous *E. macrophyllum* Hook. & Arn. of which it has the glandular pubescence and exactly the fruit. *E. macrophyllum* has neither the habit nor the distribution of a native.

Ptelea crenulata Greene is *P. angustifolia* Benth.

Ceanothus connivens Greene is a hybrid of *C. cuneatus* & *prostratus.*

Ceanothus rugosus Greene is a hybrid of *C. velutinus* & *prostratus.*

Ceanothus vestitus Greene is one of the forms connecting too closely *C. cuneatus* and *C. Greggii.*

Up to date Mr. Greene is guilty of eighteen "new species" of Lupinus, including *L. adsurgens* & *L. sylvestris*† Drew, for the naming of which he was responsible. Three species he has himself reduced—*L. Franciscanus* Greene to *L. versicolor* Lindl., *L. adsurgens* to *L. latifolius* Agardh. and *L. sylvestris* to *L. albicaulis.* Dougl.

Lupinus umbellatus‡ Greene is *L. micranthus* Dougl.

Lupinus capitatus Greene seems to be *L. Sileri* Wats.

Lupinus pachylobus Greene is *L. bicolor* Lindl.

Lupinus Pondii Greene is a form of *L. Arizonicus* Wats.

Lupinus carnosulus Greene is *L. nanus* Dougl. In the original diagnosis Mr. Greene describes it as "with the habit of large states of *L. nanus* but very distinct, wanting the variegated or changeable petals and villous-edged keel of that species; the herbage fleshy as in *L. affinis.*" An inspection of the type of *L. carnosulus* in the herbarium of the California Academy of

* There are probably only two copies of this work in America, one in the library of the Gray Herbarium, the other in the library of Mr. Brandegee.

† Bull. Torr. Club. xvi, 150

‡ Bull. Cal. Acad. ii, 145.

Sciences shows that the plant is only slightly more fleshy than in typical *nanus*, which may perhaps be accounted for by its vicinity to the coast, that the keel is ciliate and that the upper half of the banner is white, becoming rose-purple in age.

The author's motive for making and reiterating statements of this kind which may be so readily disproved is a psychical problem past finding out.

The forms of *L. microcarpus* Sims approach *L. brevicaulis* Wats. very closely and Mr. Greene has not helped matters by creating *L. malacophyllus* between them.

The perennial Lupines of Mr. Greene are in even worse case. The trouble with them is that they are nearly all intermediates in groups of species already too nearly related, and extensive revisions with consultations of distant types are necessary to determine their true names.

Amorpha hispidula Greene is *A. Californica* Nutt. "The prickle-like glands interspersed among the depressed and sessile" are very common in glandular Leguminosæ. When, as nearly always happens in age, the upper part of the gland breaks away the remaining basal portion is the "depressed and sessile" one.

Hosackia Veatchii Greene, *Syrmatium dendroideum* Greene and *Syrmatium patens* Greene, are forms of *Hosackia glabra*.

Hosackia nivea Wats. is a synonym of *H. argyræa* Greene, but this did not prevent Mr. Greene from making a subsequent *Syrmatium niveum*. This last, however, as well as *S. ornithopus* Greene is too near *H. argophylla* Gray.

Hosackia procumbens Greene is apparently *H. sericea* Benth.

Hosackia Guadalupensis Greene and probably *H. occulta** Greene, described from seedling specimens without flowers or fruit, belong to *H. grandiflora* Benth.

Hosackia macrantha Greene and *Lotus leucophæus* Greene are both *Hosackia grandiflora* var. *anthylloides* Gray. Mr. Greene in the original description of *H. macrantha* discourses concerning the subulate glands—he calls them "foliaceous." They are alike in all the forms of *H. grandiflora* and very nearly so in all

* Bull. Cal. Acad. ii, 394. Mr. Greene in his enumeration of the species in Pitt. ii, 133–150, omits this name, although in the original description it is characterized as "this unquestionably new species."

the gland-stipular species, *i. e.*, the glands when young are subulate, the upper part breaking away later and leaving the more or less thickened base.

Lotus humilis Greene is *Hosackia maritima* Nutt. and *L. tomentellus* Greene probably belongs to the same species.

Hosackia mollis Greene is a form of *H. puberula* Benth.—both too near *H. Wrightii* Gray.

Lotus hirtellus Greene is *H. strigosa* Nutt.

Lotus sulphureus Greene is *Hosackia Heermanni* Dur. & Hilg. The species was described from the Tehachapi Range, and the "San Francisco sand hills" mentioned as a station is probably an error. It is thoroughly confluent with *H. Nevadensis* Greene and it will be sufficiently difficult to keep the form represented by these three names from *H. decumbens* on the one hand and *H. tomentosa* on the other. In correction of his extremely loose nomenclature Mr. Greene will perhaps be glad to learn that there is a *Lotus tomentosus* Rhode, in Schrad. Neue Journ. 1809, p. 42; a *Lotus macranthus*, Lowe, Novit. Flor. Mad. 546; and a *Lotus sulphureus* Boiss., Tchihatch. As. Min. Bot. 1, t. 1.

Cerasus Californica Greene is *Prunus emarginata* Dougl.

The types of Mr. Greene's two species of Rosa, *R. gratissima* & *R. Sonomensis*, have not been seen by the writer, but judging by the published character, even without taking into consideration the author's well-known capacity for finding characters which remain invisible to others, they cannot be maintained.

Neillia capitata Greene is *N. opulifolia* B. & H.

Saxifraga malvacea Greene is *S. Parryi* Gray.

Heuchera maxima Greene is *H. pilosissima* F. & M.

Tellima nudicaulis Greene is *Heuchera Williamsonii* * Eaton.

Ribes Mogollonicum † Greene is *R. Wolfii* Rothrock.

Ribes Marshallii Greene is a large flowered *R. ambiguum* Wats. They are probably both forms of *R. Lobbii* which though found in Lake County has been omitted from Flora Franciscana.

Ribes quercetorum Greene seems hardly separable from *R. leptanthum*.

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* Bot. Gaz. xv, 62; xvi, 237.

† Bull. Torr. Club viii, 121.

Ribes velutinum Greene is *R. leptanthum* var. *brachyanthum* Gray—the pubescent form.

Ribes amictum & *R. Victoris* Greene are two of the forms which Mr. Greene in addition to *R. Californicum* H. & A. and *R. subvestitum* H. & A. would separate from *R. Menziesii* though he thinks *R. Victoris* possibly identical with *R. occidentale* H. &. A., "a shrub which cannot be identified by the very inadequate diagnosis given in the Botany of Beechey's Voyage." It seems not to have occurred to Mr. Greene that there are other means than these imperfect descriptions of verifying the species of Bentham & Hooker.

Lythrum adsurgens Greene is *L. Hyssopifolia* L.

Lythrum Sanfordi Greene appears to be identical with the Chilian *L. albicaulis* Bert.

Eucharidium Saxeanum Greene is *E. Breweri* Gray. It is rather common on the eastern side of Mount Hamilton.

Zauschneria latifolia, *tomentella*, *villosa* & *cana* Greene are variations of one polymorphous species, the last and most diverse, *Z. cana*, is *Z. Californica* var. *microphylla* Gray. Mr. Greene says "there is every reason for thinking that the plant of the southern part of California, which Dr. Gray had named var. *microphylla* is the typical *Z. Californica*."* He had evidently never seen Presl's plate which accords very much better with *Z. villosa* Greene.

Œnothera Hilgardi† Greene is *Œ. andina* Nutt.

Œnothera Cedrosensis‡ Greene is *Œ. cardiophylla* Torr.

Œnothera nitida Greene is a more glabrous form of *Œ. cheiranthifolia* Hornem. It is not uncommon mixed with the ordinary form, near the coast from San Francisco southward.

Œnothera crassiuscula Greene is *Œ. angelorum* Wats.

Œnothera hirtella Greene is *Œ. micrantha* Hornem.

Œnothera Jepsoni, *arguta*, & *depressa* Greene are forms separated from *Œ. biennis* by Mr. Greene along with the revived synonyms, *Œ. grandiflora* Ait. and *Œ. Hookeri* T. & G. *Œ. depressa* was described from a cultivated specimen as "pros-

* Pitt. I, 27.

† Bull. Torr. Club. x, 41.

‡ Bull. Cal. Acad. i, 187.

trate, only the spicate ends assurgent." The plant in Montana from which the seeds were gathered was, however, according to the collector, entirely erect.

Godetia micropetala Greene is *G. quadrivulnera* (Dougl.) with depauperate corolla. Mr. Greene in Flora Franciscana says: "spike rather short," but his type shows it to be nearly a foot long with remote flowers.

G. pulcherrima Greene is what has been known as *G. Bottæ* Spach. Mr. Greene finds it quite different in color from typical *Œ. Bottæ*, but fails to explain how he came by his exact knowledge of the coloring of *Œ. Bottæ*. It is indeed too probable that a part of the southern *Œ. Bottæ* as received, belongs to *Œ. amœna* Lilj. and the remainder to *Œ. biloba* Wats. *Œ. pulcherrima* Greene is very common, ranging from Lake County to San Diego. It is not distinguishable by any character from entire-petaled forms of *Œ. biloba* and shares with it a somewhat inconstant character—the purple or lilac sepals—which is the most striking difference readily observable between forms of *Œ. amœna*, and these others.

Godetia purpurea Wats. of which Mr. Greene writes: "Mr. Watson attributes to this species two rows of seeds in each cell of the capsule. No such plant has been recognized by the present writer," is not uncommon in the Sacramento Valley. Mr. Greene will find it if he looks along the trenches by the side of the railway near Elmira. The character "two rows of seeds in each cell" is probably as inconstant as the pedicel of the *amœna* group. Specimens of what Mr. Greene would probably call *G. rubicunda* collected near Sonoma by John MacLean show two rows in their very large capsules.

Sium heterophyllum Greene is probably not a native species.

Selinum eryngiifolium Greene is a common form of *S. capitellatum* B. & H. with rather more dissected foliage.

*Galium buxifolium** Greene is *G. Catalinense* Gray.

Galium flaccidum Greene is *G. Californicum* F. & M.

Galium Miguelense Greene is *G. Nuttallii* Gray.

Sambucus callicarpa & *S. maritima* Greene=*S. glauca* Nutt. The diagnosis of *S. callicarpa* is a mixture of the charac-

* Bull. Cal. Acad. ii, 150.

ters of *S. glauca* and *S. racemosa*, but is principally of the first, and his type specimens are from trees of *S. glauca*. He says: "The arborescent habit, stipulate and often bipinnate leaves, but more than all the broad and flat rather than thyrsoid inflorescence and fruit-clusters mark this [*S. callicarpa*] as a species very distinct from the Old World *S. racemosa*, in which latter the corolla lobes moreover are closely reflexed against the pedicel. The eastern shrub, *S. pubens*, is easily distinguishable from both by a character not hitherto mentioned, *i. e.*, the large, rounded and very conspicuous winter-buds. The red-berried elder of the northern woods from Oregon to Alaska is not *S. racemosa*, for it has, like our species, very ample and almost flat-topped cymes; but neither am I confident of its identity with *S. callicarpa*. Our tree has small winter-buds and is hardly in flower before April, putting forth its leaves in March."*

Subsequently he redescribes the plant as *S. maritima*: "Though I named as the type of my *S. callicarpa* the beautiful, scarlet-berried elder common in California, and called *S. racemosa* in the State Survey Botany, the description of the trunk, foliage, etc., was drawn from fresh specimens of a tree which now proves by its mature fruit to be a wholly distinct and new species. Said trees, which, by their early flowering and general resemblance to the red-berried species, I had always supposed to be that, had always interested me deeply by their strangely maritime habit. They stand at only a few rods distance from a sand-beach of San Francisco Bay; and that in a depression which cannot more than equal the level of the salt water at less than the highest tide. * * * By its early flowering and other peculiarities, it is clearly of that group which embraces *S. racemosa*, *callicarpa* and *melanocarpa*. That the American *S. pubens* is distinct from *racemosa* I indicated in the Flora Franciscana." †

This remarkable group of *Sambucus glauca* furnishing from the same stem type specimens of two species, both according to the author to be kept up, may be seen along the northern end of Shell Mound. It is not in danger, as one would infer from the author's language, of a bath of salt water. Mr. Greene evidently

* Flora Franciscana, 342.

† Pitt. ii, 297.

intends his first name to apply to our red-berried elder, because he mistook the trees for that species, describing them when in flower. Later when he found the fruit glaucous he gave them the second name.

Valeriana rhombifolia Greene is at Harvard credited to *V. scorpioides* DC.

Grindelia Hendersoni Greene is *G. Oregana* Gray.

Grindelia lanata Greene is the more pubescent form of *G. integrifolia* DC.

Grindelia patens Greene is *G. hirsutula* H. & A.

Grindelia rubricaulis DC. Prodr. v. 316, 1836, is taken up by Mr. Greene in place of *G. hirsutula* H. & A. Bot. Beech., 147. It has already been shown on a preceding page that the Californian part—not the supplement—of Botany Beechey, must have been printed simultaneously with the first volume of Hooker's Flora Boreali-Americana, printed in 1833. To adopt the true date of Hooker's Flora, and continue the obviously incorrect one of the early parts of Bot. Beechey admits apparently of the largest amount of changes possible. Mr. Greene's action tacitly infers gross injustice on the part of De Candolle's contemporaries. We shall be driven finally to settle these matters by affidavits from the printers or excerpts from ancient ledgers.

Grindelia patens Greene is *G. hirsutula* H. & A. As Mr. Greene had not access to the types how could he be certain that *G. rubricaulis* and *G. hirsutula* did not represent the two forms into which he would divide the received *G. hirsutula?*

Hazardia detonsa, *cana*, & *serrata* Greene are all the same species, *Diplostephium canum* Gray.

Helianthella Nevadensis * Greene is *H. Californica* Gray.

Viguiera Parishii † Greene is *V. deltoidea* Gray.

Madia hispida Greene is *M. elegans.* Mr. Greene is in error in his statement that it flowers at a different season.

Chænactis lacera Greene is a pappose variety of *C. artemisiæfolia* Gray.

* Bull. Cal. Acad. i, 89.

† Bull. Torr. Club. ix, 15.

Laphamia Peninsularis Greene * is *Perityle Fitchii* Gray.

Senecio Blochmanæ Greene is *S. Douglasii* DC.

Prenanthes stricta Greene is *Luina Piperi* Rob. Mr. Greene's name is the earlier, but it is a curious commentary on his attempt to separate the Cichoriaceæ as a distinct order from the other Compositæ that he should have referred a Senecio to Prenanthes. His latest attempt to settle its relationship is to put it into Cassini's "Psacalium," but as Psacalium is always reduced to Cacalia and Cacalia usually to Senecio he might as well have reduced it to that genus at once.

Malacothrix altissima † Greene seems to be only the inland form of *M. saxatilis* T. &. G. A specimen collected on the Santa Lucia mountains and referred by Mr. Greene to *M. altissima* is certainly nothing but *saxatilis.* The type is from Tehachapi, and was collected by the writer.

Malacothrix insularis ‡ & *squalida* § Greene and *M. foliosa* Gray are forms of the same species.

Stephanomeria virgata Benth. *S. paniculata* & *exigua* Nutt. *S. coronaria* ‖ & *tomentosa* ¶ Greene and "*Ptiloria*" *canescens* & *pleurocarpa* Greene, represent at the utmost three species, and they are so difficult to discriminate and so entangled with connecting forms that they may have to be reduced to one.

Lobelia Rothrockii Greene is the variety *serrata* of *Palmerella debilis* Gray.

*Downingia concolor,*** *humilis, insignis, montana, ornatissima* & *tricolor* Greene are forms of a single polymorphous species. Three or four of them can often be collected in the same "hog-wallow." At Vanden Station, for instance, in the same late-dried depression, the writer collected *D. pulchella, D. ornatissima, D. concolor* & *D. humilis.*

Howellia limosa Greene is extremely like the terrestrial form of *H. aquatilis* Gray. The chief difference seems to be in the

* Bull. Cal. Acad. i, 8.

† Bull. Cal. Acad. i, 195.

‡ Bull. Cal. Acad. i, 194.

§ Bull. Cal. Acad. ii, 152.

‖ Bull. Cal. Acad. i, 194.

¶ Bull. Cal. Acad. ii, 152.

** Bull. Cal. Acad. ii, 153.

smaller seeds of *H. limosa*, but those of the terrestrial form of *aquatilis* are hardly known. A form of *limosa* was collected in May, 1892, in a trench by the side of the railway about a mile north of Suisun. The plants formed a matted mass several feet in length, and were fruiting abundantly from extremely minute cleistogamous flowers—no others were to be found. Mr. Greene's station was not far distant. Both the locality and the rarity of this plant show it to be in all probability a recent introduction.

Arctostaphylos insularis,* *patula* & *media* Greene are like nearly all the recent species proposed, mere variations of the older ones of which several are maintained with difficulty.

Rhododendron Sonomense Greene is *R. occidentalis* Gray.

Pholisma depressum Greene † is *P. arenarium* Nutt.

Dodecatheon Clevelandi, *Cusickii*, *cruciatum*, *patulum* and *pauciflorum*, are forms of *D. Meadia* L. If the circumscissile dehiscence of the capsule prevailing in most of the western forms of Dodecatheon be made a specific distinction, it was already named before Mr. Greene began, but it has been shown that this form of dehiscence grades into the ordinary one.‡

Gentiana superba Greene is credited at Harvard to *G. lanceolata* Griseb.

Collomia diversifolia Greene is a stout form of *C. heterophylla*. The type was collected by the writer.

Gilia parvula Greene is *G. viscidula* Gray.

Navarretia microcarpa Greene is *Gilia filicaulis* Torr.

Navarretia prolifera Greene is a large-flowered form of *Gilia divaricata*.

Navarretia nigellæformis Greene is a yellow-flowered form of *Gilia cotulæfolia*. It is common about Antioch and in Lake County, and has been collected at San Luis Obispo by Miss M. M. Miles.

Navarretia subuligera, *leptantha foliacea*, & *hamata* Greene are forms of *Gilia atractyloides*, some of them connecting rather closely with *G. viscidula*.

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* Bull. Cal. Acad. ii, 494.

† Bull. Cal. Acad. i, 198.

‡ Zoe i, 19.

Leptosiphon rosaceus Greene is the well-known *Gilia androsacea* var. *rosacea* Gray, of the sand hills of San Francisco.

Leptosiphon acicularis Greene is the yellow-flowered form of *Gilia micrantha*. Mr. Greene's reasons as given by himself for neglecting the older names are not very convincing. His free use of the word "invariably" is calculated to alarm any one who knows of the almost infinite variety of forms belonging to *G. androsacea* and *G. micrantha*, for the consequences when Mr. Greene shall have been made acquainted with a score or two of them.

Hesperochiron ciliatus Greene is *H. pumilus*, Porter.

Phacelia scabrella Greene is *P. distans* Benth.

Phacelia Arthuri Greene was identified by Mr. Congdon* with *P. platyloba* Gray.

Phacelia suaveolens Greene. This was described as having "4-seeded capsules," and the author in the note under the specific character says:† "It is another of those species which eliminate the boundaries of subgenera or sections; for it combines the capsule and seed of Euphacelia with the narrow elongated corolla of Microgenetes." By a fruiting fragment kindly placed at the writer's disposal by Mr. Greene it is found to belong to Eutoca. The fragment contained a number of empty capsules, and the four still retaining their seeds held eight, six, three, and two respectively, and examination of the empty capsules showed in the larger ones on each half-placenta the points of attachment of six or eight seeds. The author was therefore probably misled by the depauperate upper capsules. The fragment bore neither leaf nor flower, but the published character with the notes here given make it probable that it is *P. brachyloba* Gray, which was described from Monterey and not known farther north until last year, when it was found in great abundance on Tamalpais beyond the second summit.

Phacelia rugulosa & *P. leucantha* Lemmon in herb., Pitt. i, 175. These are respectively strict synonyms of *P. affinis* & *P. Orcuttiana* Gray, Supp. Syn. Fl. ii, part 1. This is one of the instances which serves to show that there are two sides to the question of

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* Zoe ii, 125.

† Pitt. i, 223.

the justice or generosity of publishing herbarium names. Many botanists write names in their herbaria as a reminder to study such specimens in the future as time admits, and it is not at all probable that Mr. Lemmon, who is much more careful in such matters than Mr. Greene, would when he came to study the species have passed over the very accessible descriptions furnished by the Synoptical Flora.

Convolvulus Binghamiæ Greene* is *C. sepium* L. It is common in the tule marshes of the lower Sacramento.

Convolvulus macrostegius† Greene is *C. occidentalis* Gray.

Lycium Hassei Greene is *L. Richii* Gray.

Antirrhinum Kelloggii Greene‡ is *A. strictum* Gray, not *A. Kingii* Watson, as referred in Supp. Syn. Fl. ii, 439. The author corrected his mistake.

Collinsia stricta Greene is evidently *C. tinctoria* Hartw.

Collinsia arvensis Greene is what is usually called *C. sparsiflora* F. & M. In some remarks on *C. Franciscana* in Zoe iii, 369, it was shown to be unsafe to separate forms from the type until the type itself was more fully described. The principal character on which *C. Franciscana* rested was its more numerous seeds, assuming that the typical form had but few. *C. stricta*, however, at least a specimen from Michener & Bioletti, labeled "*Collinsia stricta* Greene, No. 1662 a, South Los Guillicos, March 13, 1892," has twelve ovules.

Russellia retrorsa Greene is *R. sarmentosa* Jacq.

Pentstemon arenarius Greene bears on the collector's label the words, "I think it is a variety of the very variable *Pentstemon deustus*. Prof. Gray."

Pentstemon leucanthus Greene is one of the narrow-leaved forms of *P. azureus* Benth.

Pentstemon Sonomensis & *Davidsonii* Greene are well-known forms of *Pentstemon Menziesii* Hook. The first has been for many years in the herbarium of the California Academy of Sciences, from Mt. St. Helena. Mr. Greene in describing it compared it with the sarmentose *P. corymbosus*. He attempts to

* Bull. Cal. Acad. ii, 417.

† Bull. Cal. Acad. i, 208.

‡ Bull Torr. Club x, 126.

strengthen the species by remarks concerning differences of climate, but unaccountably omits to mention the fact that the flanks of Mt. St. Helena and of the Coast Range north of San Francisco generally, are notoriously foggy in summer, and therefore not the parched region his language would infer. *Pentstemon Davidsonii* is the Alpine form of the species. It was collected by Dr. Gustav Eisen on high mountains at the head of King's River in 1885; by Mr. H. W. Turner of the United States Geological Survey, at 10,000 feet, in Tuolumne County, July 1888; and by Mr. J. M. Hutchings on Mt. Conness in 1891. These last which are from the typical locality, show that Mr. Greene was either unfortunate in his specimens or careless in his statements.

Diplacus arachnoideus, * *parviflorus* & *grandiflorus* Greene are forms of *Mimulus glutinosus* Wendl.

Mimulus glaucescens, † *arvensis, glareosus* & *nasutus* ‡ Greene are forms of the polymorphous *M. luteus* L. *M. nasutus* in typical form might be maintained as a good variety if the forms connecting were not so numerous.

Mimulus geniculatus § Greene is *M. floribundus* Dougl.

Castilleia hololeuca Greene was erroneously described as having the calyx "deeply cleft on the upper side, merely lobed on the lower." The type shows it to be about equally cleft, and the species rests only on the slender basis of the pubescence, which is nearer *C. Pringlei* than *C. foliolosa.*

Monardella discolor Greene is *M. villosa* Benth. It is the same as Brandegee's No. 235, of 1882, from the Yakima Region, Northern Transcontinental Survey.

Sphacele fragrans Greene is *S. calycina* var. *Wallacei* Gray.

Salvia Bernardina ‖ Greene is probably, as Gray thought, a hybrid.

Stachys acuminata ¶ Greene was by the author reduced to *S.*

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* Bull. Cal. Acad. i, 210.

† Bull. Cal. Acad. i, 113.

‡ Bull. Cal. Acad. i, 112.

§ Bull. Cal. Acad. i, 280.

‖ Bull. Cal. Acad. i, 211.

¶ Bull. Cal. Acad. ii, 410.

Californica Benth.—the latter itself considered by Dr. Gray only a form of *S. bullata* Benth.

Chorizanthe Nortoni Greene is a variety of *C. Douglasii* Benth.

Eriogonum grande & *rubescens* Greene are mere variations of *E. nudum* Dougl.

Eriogonum molle Greene described as "not in flower" has since been collected in better specimens and proves to be *E. giganteum* Wats.

Eriogonum robustum Greene* is the form of *E. Lobbii* growing at lower elevation. The type of *E. robustum*, collected by the writer, was found at about 4,500 feet.

Eriogonum elegans Greene is one of the forms of either *E. gracile* Benth. or *E. Baileyi* Wats. *E. Baileyi* as everyone knows was formerly termed "*E. gracile* var. *effusum*," and there are numerous forms now known which can be referred equally well to either. Mr. Greene's reason for comparing it to the suffrutescent *E. saxatile* cannot be conjectured.

Eriogonum agninum Greene judging from the imperfect character is *E. gracile* var. *leucocladon* (*E. leucocladon* Benth.).

Eriogonum Davidsonii Greene Pitt. ii, 295 was reduced by the author in "Errata" a few pages further on in the line "*Eriogonum Davidsonii*=*E. molestum* Wats."

Eriogonum taxifolium Greene has by other botanists always been considered a form of *E. Wrightii* Torr.

Pterostegia galioides† Greene is *P. macroptera* Benth.

Pterostegia fruticosa† Greene (*Harfordia fruticosa*,‡ Greene & Parry) is apparently only an insular variety of the same.

Atriplex dilatata Greene is *A. Barclayana* (Benth.)

Atriplex nodosa Greene is *A. expansa* Wats. It was described from a single old and fragmentary specimen collected by the writer. *A. expansa* often shows two strikingly different forms of fruit in the same plant.

Amarantus carneus Greene is probably an introduced weed. It may be *A. polygonoides* L., though from the very imperfect

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* Bull. Cal. Acad. i, 126.

† Bull. Cal. Acad. i, 212–13.

‡ Proc. Dav. Acad. v, 26.

description one cannot be certain even that it belongs to Amarantus.

Euphorbia Benedicta Greene is *E. misera* Benth.

Euphorbia velutina * Greene is *E. tomentulosa* Wats.

E. Parishii† Greene, described as "suffrutescent" and as having "the aspect of *E. polycarpa*, but the peculiar flowers of that very dissimilar species, *E. ocellata*, which is annual, with much larger, veiny leaves and round oval seeds," has in the typical specimen no root. Mr. Parish, who collected it, writes: "My own specimen is reduced by repeated division to a mere fragment but the root remains and is plainly annual."

In "West American Oaks" Mr. Greene by the information gained in one hasty trip, made at such a season of the year as to furnish him neither flowers not mature fruit, reached conclusions the opposite of those held by Engelmann, which were the result of several seasons of field study and of a great mass of material from all parts of the country sent in answer to his call. Further study by botanists without the mania for new species which characterizes Mr. Greene is much more apt to reduce than increase the number recognized by Engelmann.

The white oak of the southern part of California was considered by Engelmann to belong to *Q. oblongifolia*. Mr. Greene separates it as a species, under the name *Q. Engelmanni* Greene.

As Mr. Greene's figures sufficiently show, *Quercus Douglasii* H. & A. as it goes south runs into forms which are differently placed by botanists either in *Q. Douglasii* or in *Q. oblongifolia* (*Q. Engelmanni*), and the first duty of an investigator of our oaks is to show that they are not northern and southern forms of the same species. In a climate like that of California the question of deciduous or persistent leaves makes very little showing in the matter.

Quercus McDonaldi Greene if separable from *Q. oblongifolia* cannot be held distinct from forms of *Q. undulata* Torr. such for instance as the one taken up by Mr. Greene under the name *Quercus venustula*.

Quercus McDonaldi var. *elegantula* Greene was admitted by

* Bull. Cal. Acad. ii, 57.
† Bull. Cal. Acad. ii, 56.

the author to be a hybrid between *Q. Engelmanni* & *Q. dumosa.* In this he may or may not be correct. There are large trees of the same form near Escondido, San Diego County.

Quercus turbinata Greene is of course a form of *Q. pungens* Liebm., itself considered by Dr. Engelmann only a variety of *Q. undulata.* The drawing represents either an extreme, unusual form, or the proportion between the acorn and the cup is not correctly shown. The specimens in the herbarium of the California Academy of Sciences collected at the same time and place by Mr. Dunn have longer cups and acorns one-fourth shorter.

Quercus parvula Greene is *Q. Wislizeni DC.*

Quercus Gilberti Greene founded inexcusably on a sterile branch has been since investigated by a botanist resident in the vicinity and found to be *Q. Garryana* Dougl. as is also of course *Q. Jacobi* R. Br. which Mr. Greene would revive.

Quercus dumosa var. *polycarpa* Greene was admitted by the author to be only an abnormal form.

In a previous notice* of the West American Oaks it has already been shown how in attempting to re-establish *Quercus vaccinifolia* Kell. Mr. Greene falsified the record perhaps inadvertently, and described the shrub as "very leafy and its small entire leaves, these and its young branches being wholly destitute of the fulvous lepidote pubescence of *Q. chrysolepis*,"† though the original description‡ and painting of Dr. Kellogg were perfectly familiar to him.

Allium dichlamydeum Greene is *A. serratum* Wats. Mr. Greene failed to describe the bulb-coats for some reason, though it could not have been for lack of material, as it grows abundantly in San Francisco where he collected it. The reticulation is much more exactly typical than that of the form found in the interior.

The two species of Muilla proposed by Mr. Greene *M. transmontana* and *M. coronata* differ from *M. maritima* only in their

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* Zoe i, 156–9.

† West American Oaks, 45.

‡ Proc. Cal. Acad. i, 96, (p. 106, 2nd edition). "Leaves annual, coriaceous, small, oblong-ovate, acute, sub-mucronate, somewhat obtuse at base; glabrous above, reticulate; fuscous and stellate-pubescent beneath."

filaments. In the Botany of California these are described as filiform, which is probably never the case—they are thickened toward the base and more or less deltoid-dilated in all the forms found about the Bay of San Francisco. While it is possible that one of Mr. Greene's species may be maintained it is much more to be suspected that these forms, alike almost to the minutest particular in all other respects, will prove to be filament variations of the original.

*Bloomeria montana** Greene is *B. aurea* Kell.

Brevoortia venusta Greene, according to Mr. Carl Purdy who discovered it, is a hybrid between *Brevoortia Ida-Maia* and *Brodiæa congesta.*

Brodiæa insularis† Greene is *B. capitata* Benth.

Triteleia candida‡ Greene is a not uncommon white form of *Brodiæa laxa.*

Triteleia lugens § Greene is a form of *Brodiæa ixioides* with the appendages to the filaments shorter than usual.

Triteleia lilacina || Greene, known only in a single imperfect specimen collected by the writer, was not well described. It differs from typical *Brodiæa lactea* only in the filaments above the membranous expansion adnate to the tube. In *T. lilacina* the membranous margin is nearly obsolete in the free part, while in the ordinary form it is continued in triangular form nearly to the top of the filament. Some specimens just received from Mrs. M. E. P. McCowen, of Ukiah, are exactly intermediate between typical *lactea* and *lilacina.*

Hookera leptandra Greene, from the description, is a form of *B. grandiflora.*

Hookera rosea ¶ & *Orcuttii* ¶ Greene as well as several species by other recent authors, will certainly be found untenable. They are all founded on the presence or absence of staminodia, appendages to the filament, or slight variations in their length. It seems even to be the opinion of some that the shape of the staminodia, more or less notched as they approach the anther form, entire or acuminate as they recede, is sufficient warrant for the separation of species.

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* Bull. Cal. Acad. i, 281.
† Bull. Cal. Acad. ii, 134.
‡ Bull. Cal. Acad. ii, 139.
§ Bull. Cal. Acad. ii, 142.
|| Bull. Cal. Acad. ii, 143.
¶ Bull. Cal. Acad. ii, 137-8.

Mr. Orcutt, who however regards "*Hookera Orcuttii*" as a valid species, has made some observations on the staminodia of *Brodiæa minor* that are of interest. He says: "In examining a large number of the flowers of *Hookera minor*, Britten, in the field this spring, I was somewhat surprised to find numerous specimens in which the staminodia were changed to perfect fertile stamens. The first instance noticed was in a flower evidently injured by some insect, but so many examples were found later, where the staminodia were partially or wholly changed into anther-bearing stamens, that I cannot ascribe it to the work of insects. This illustrates how little value can be placed in this genus on the unreliable characters of the stamens and staminodia."*

The characters upon which Mr. Greene would separate his "*Unifolium liliaceum*" from *Smilacina stellata* Desf. or *S. sessilifolia* Wats., it is difficult to say from which for they are not easily kept apart, are not at all constant. They vary much in different climates and exposures, as Mr. Greene in effect admits when at Lake Pend d'Oreille "where in deep shades of fir and arbor vitæ one meets with plenty of *U. sessilifolium;* and here too outside of and above the wet woods, on open ground and in dry soil, grows the unmistakable *U. stellatum*."† Miss Eastwood has carefully observed *Smilacina stellata* as it occurs in Colorado, and finds the grown but unripe fruit dark green with darker bands; the ripe fruit clear bright red. The distichous zigzag stem and plicate leaves are not constant in any of the forms.

Zygadenus porrifolius Greene ‡ is *Z. elegans* Pursh. Mr. Greene says "none of the segments are unguiculate or much contracted at base," but the type shows that the inner segments are abruptly contracted into a broad claw.

Calochortus amœnus Greene, although compared by the author with the yellow-flowered and much more distant *C. pulchellus*, can hardly be considered more than a rose-colored variety of *C. albus*. The color is not uncommon in typical *C. albus*, but the gland is lower and its scales crisped with shorter hairs.

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* West. Am. Scientist vi, 63.

† Pitt. ii, 33.

‡ Bull. Torr. Club. viii, 123.

Calochortus Plummeræ Greene is evidently *C. Weedii* var. *purpurascens* Watson.

Calochortus excavatus Greene is a form of *C. Nuttallii* T. & G. which is rather common in Nevada.

Calochortus invenustus Greene has not been accessible to me. It may be *C. flexuosus* or *C. Palmeri*, both of which have been found not very far away. It might be well for Mr. Greene, before making any more species on such grounds, to read with care some recent observations by S. B. Parish on the variation not only of the markings but of the gland.*

If *Tradescantia tuberosa*† Greene were a good species it would yet have, under the rule by which the author changed *Horkelia parviflora* Lehm. to *Potentilla Andersoni*‡ Greene, to suffer eclipse on account of the previous *T. tuberosa* Roxb.

Sagittaria Sanfordi Greene collected first in the sloughs about the city of Stockton and since that time on the margins of pools along the county road between Lathrop and Banta was so imperfectly described by the author that even the section to which it belonged could not be made out. It proves to belong to the second division of the genus as formulated by Micheli. The pedicels of the female flowers are much thickened (the flowers are white), and the lamina of the leaf often considerably expanded. It has not the appearance nor the distribution of an indigenous plant, but has not so far been identified with any foreign one.

Juncus uncialis Greene has been collected by the writer at various places, including the locality at which the type was found. It is certainly *J. triformis* var. *uniflorus* Engelm. (*J. segetalis* Engelm.). The seeds in our specimens are faintly ribbed and cross-lined. The author will find that the degree of maturity of the seeds has much to do with the distinctness of their markings.

Cupressus Arizonica § Greene is not usually considered distinct from *C. Guadalupensis* Watson.

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* Zoe iii, 352–4.

† Botanical Gazette vi, 185.

‡ Pitt. i, 104.

§ Bull. Torr. Club ix, 64.

A NEW SUBSPECIES OF CEROPLASTES FROM MEXICO.

BY T. D. A. COCKERELL.

In Zoe, Vol. iii, Oct. 1892, Prof. C. H. Tyler Townsend describes, without naming, a Ceroplastes found by Dr. A. Dugès at Guanajuato, Mexico, on Bignonia and Chrysanthemum. Prof. Townsend has now kindly sent me two examples of this Ceroplastes, with the suggestion that if new, the species might be called *C. cistudiformis*. I have adopted this name, while regarding the insect as hardly a distinct species, but rather a subspecies of *C. psidii*, Chavannes, 1848.

CEROPLASTES PSIDII CISTUDIFORMIS, subsp. nov.

Scale: (largest specimen) length 7¼ mm., breadth 6 mm., alt. 4¼ mm. Color pale grey, with a slightly pink tinge at sides. Each cereous plate with numerous radiating fine blackish lines, and the lateral plates with two not very well-defined concentric lines. Below the nucleus of each lateral and terminal plate, the margin is broadly yellowish-white, without marks; these broadly triangular yellowish-white portions are separated above from the rest of the scale by black bands, which become evanescent towards the nuclei of the plates. The central plate has stronger radiating lines or bands at intervals, giving it the superficial appearance of being divided into several, as is the case in *C. janeirensis* and *psidii*.

The plate-nuclei are small, blackish, with the usual white secretion in the centre. That of the dorsal or central plate is rather large. Inside of the (cereous) scale pale ochreous, the divisions between the plates marked with purplish-brown.

Dorsal plate approximately circular, its posterior half strongly gibbous in both the specimens.

Anterior end with a single plate resembling the adjacent lateral. Each side with two approximately square lateral plates.

Posterior end with a very large broad compound plate, with two distinct nuclei, and an obscure third one between them.

One of the specimens contained the desiccated body of the ♀. The skin (corresponding to the "scale" of a *Lecanium*) is yellow

by transmitted light, with many scattered black (as they appear) gland-dots.

Adult ♀, placed in caustic soda, appears crimson, and stains the liquid.

The legs are very small, red-brown. Tibia about one quarter longer than tarsus. Femur about one-third longer than tibia. Tarsal knobbed hairs well-developed. The claw appears as if bulbous at the tip, but this is certainly due to the large bulbous digitules, as in *psidii*.

Compared with the figure of *C. psidii* given by Signoret, the present subspecies seems very different; but when we come to compare the characters in detail, it is apparent that the differences are those of degree rather than of kind, so that it is hard to accord to the Mexican form more than subspecific rank. *C. psidii* was found at Rio Janeiro, and is probably not to be separated as a species from *C. janeirensis*, Gray, 1828.

The present insect belongs to a group of Ceroplastes which is characteristic of the neotropical region, and includes the following species: *C. jamaicensis*, White (Jamaica); *C. cirripediformis*, Comst. (Jamaica, Florida); *C. denudatus*, Ckll., n. sp. (Antigua); *C. depressus*, Ckll., n. sp. (Jamaica); *C. janeirensis*, Gray (Brazil); *C. plumbaginis*, Ckll., n. sp. (Antigua); *C. psidii*, Chav. (Brazil); and perhaps *C. chilensis*, Gray. The three new species mentioned will be described elsewhere.

INSTITUTE OF JAMAICA, March 7, 1893.

RECENT LITERATURE.

E. STRASBURGER: Histologische Beitrage, Heft. iv. *Ueber das Verhalten des Pollens und die Befruchtungs—vorgäuge bei den Gymnospermen. Schwärmsporen, Gameten, pflanzliche Spermatozoiden, und das Wesen der Befruchtung.*—Jena, 1892.

As new facts are brought to light we are constantly obliged to alter our views. Nowhere is this truer than in regard to the structure and functions of the plant-cell. With the marvelous advances made in histological methods, more and more accurate information concerning the minutest details of cell-structure is being brought forward, and this frequently involves material changes in statements hitherto unchallenged.

The extremely interesting and valuable work before us illustrates this most strikingly. Probably no living botanist has contributed so much to our knowledge of the plant-cell as Strasburger, and any statements that come from him on this subject bear the stamp of authority; yet in the present work he has found it necessary to modify very substantially some of his earlier published statements. The work was evidently inspired largely by the recent remarkable discoveries of Guignard, and to some extent also by important researches by Belajeff.

The volume before us is divided into two parts; the first deals with the development of the pollen and the process of fertilization in Gymnosperms; the second, with a comparative study of the zoospores of algæ and spermatozoids, and studies in fertilization in various groups of plants.

Until very recently it was supposed that in the Gymnosperms, with the exception of the Cycads, that but two cells were formed in the ripe pollen-spore, and that the nucleus of the larger one which forms the pollen-tube, was the direct agent in fertilization. Belajeff* demonstrated that in *Taxus* it was the smaller cell that represented the fertilizing element, and Strasburger now finds that this is true also in other Gymnosperms. He also finds that in a number of forms examined, e. g., *Larix*, *Picea*, *Pinus*, *Ginkgo*, that three cells are successively cut off from the body of

*"Zur Lehre von den Pollenschlauchen der Gymnospermen." Ber. der Deutschen botanischen Gesellschaft—1891—Bd. ix, p. 280.

the spore, but that of these three usually but one persists, the first two formed being disorganized soon after they are cut off, so that in the ripe spore but one of these is to be readily seen. This small cell he considers homologous with the antheridium of the heterosporus Pteridophytes. This antheridial cell often divides into two, a small stalk-cell, and a larger one which represents the real generative part. He found that wherever this antheridial body was pluricellular, that it was always formed before the dehiscence of the sporangium.

As the pollen-tube grows, the generative cell of the antheridium becomes detached and passes down the pollen-tube, where it divides into two cells which must be regarded as homologous with the sperm-cells of the lower archegoniates. In the Cupressineæ both cells are functional, and thus two archegonia may be fertilized by a single pollen-tube; in the Abietineæ, however, only one of the two sperm-cells appears to be functional. In the meantime the nucleus of the pollen-tube has also divided, but these nuclei take no apparent part in the process of fertilization, contrary to the earlier views of Strasburger and others. Fertilization is effected by the discharge of the contents of the generative cell through the end of the pollen-tube into the archegonium.

From a study of the three genera of the Gnetaceæ—*Gnetum*, *Ephedra*, and *Welwitschia*, our author concludes that they represent the end members of three separate lines of development within the Gnetaceæ, which together with the other Gymnosperms have had a common origin lower down in the system.

After a careful study of the alleged differences in the male and female nuclei with reference to different stains, he comes to the conclusion that this difference depends entirely upon the amount of cytoplasm taken up by the nucleus for its nourishment. In all cases he claims that the nuclein itself is "kyanophil"—that is, has a special avidity for blue stains, when compared with the cytoplasm; in all cases during nuclear-division the nuclear-segments are distinctly kyanophil. He therefore concludes that when the female nucleus is erythrophil it is due to the presence in it of unassimilated cytoplasm.

The second part of the work deals with the formation and structure of zoospores and spermatozoids, and the process of fertil-

ization. The opening pages review Guignard's discovery of the "attraction spheres" and "centrosomes," structures long known in animal cells, but not hitherto certainly demonstrated in those of plants. These Strasburger regards as essential constituents of the cell, and therefore assumes that they must take part in fertilization, which can no longer be regarded as consisting in the union of the sexual nuclei alone.

Before passing to the consideration of the zoospores the author describes for the first time the occurrence of the attraction spheres in an alga—*Sphacelaria scoparia*—in which he found these easily demonstrable, and concludes as they have been found in so many widely diverse forms, that they are probably always present when there is a separation of the protoplasm into cytoplasm and nucleus. For the protoplasm radiating from the centrosomes, and that composing the spindle-fibres and connecting threads of the karyokinetic figures, he proposes the name "kinoplasm," and supposes it to play an important part in nuclear division.

The development of the zoospores was carefully studied in a number of algæ belonging to different groups. The most important conclusions reached were that the transparent end of the zoospore is composed of kinoplasm that gives rise to the cilia which are formed as outgrowths from it. The envelope in which the zoospores are often contained when first ejected from the mother-cell, is the outer protoplasmic layer (*Hautschicht*) of the mother-cell, and not part of the cell-wall as hitherto supposed.

Comparing the development of the non-sexual zoospores with that of the gametes or sexual ones, and also of the spermatozoids of higher cryptogams, he points out clearly the common nature of all these forms. In *Chara fragilis*, according to his account, the forward, cilia-bearing coils of the spermatozoid, orignate as a cytoplasmic appendage of the nucleus, and the hinder coil is also of cytoplasmic origin, and corresponds to the hinder granular part of a zoospore. Only the middle coil is composed of nuclear substance, instead of the whole body of the spermatozoid as has been supposed. The forward coil gives rise to the cilia in the same way as the clear forward end of a zoospore does, and like that he considers this to be composed of kinoplasm. In mosses and ferns, only the small forward coils of the spermato-

zoid are cytoplasmic, while the whole of the large posterior coils is nuclear. The vesicle always attached to these is supposed to be homologous with the posterior part of the body of the spermatozoid of *Chara*, or the granular hinder part of the body of a zoospore.

While he was unable to demonstrate it, he considers it extremely probable that the kinoplasm of the forward part of the spermatozoid contains the centrosomes which are thus transferred to the egg.

In regard to the part which each element plays in the act of fertilization, Strasburger comes to the conclusion that, as Weismann believes, the nuclei are the direct agents of hereditary transmission. As to the centrospheres and kinoplasm, the former are supposed by our author to represent "the kinetic centres from which the impulses for nuclear division, and to a certain extent for cell-division, proceed." The kinoplasm "we consider as the conducting substance for the impulses that radiate from nucleus and centrospheres, and represents the specific motile element in the protoplasm." With each cell-division this kinoplasm is supposed also to divide.

The name proposed by Sachs, "Energid," is adopted for that unit composed of nucleus, centrospheres, and kinoplasm.

He is inclined to give up the view that in the resting nucleus the segments are separated, and to adopt his earlier view that they anastomose so as to form a net-work with no free ends. As an argument against the autonomy of the segments in the resting nucleus, the sudden change in their number which sometimes occurs is cited.

The conclusion finally reached is that the essence of fertilization consists of the introduction into the "entwicklungsfähig" egg of the active "energid" through which the rapid division of the egg is inaugurated.

DOUGLAS H. CAMPBELL.

PROCEEDINGS OF SOCIETIES.

CALIFORNIA ACADEMY OF SCIENCES. *February 6, 1893.* President Harkness in the chair.

Additions to the museum were reported from N. A. Freeman, G. C. Duncan, J. Anderson, John Hemsley, H. N. Cook, J. Z. Davis, Rev. F. H. Wales, C. P. Nettleton, J. H. Cluff, James E. Fowler, T. K. Couperus.

The Librarian reported 225 additions to the library.

Mr. W. L. Watts read a paper on "Natural Gas in the San Joaquin Valley."

Mr. W. S. Chapman called attention to the fact that a bill had been introduced in Congress to contract the limits of the Yosemite Park Reservation, and moved that a committee be appointed to prepare resolutions requesting the Senators and Members of Congress from this State to use their utmost endeavors to preserve the present limits of the Reservation. Messrs. Chapman, Eisen, Hittell, and McDonald were appointed.

Dr. Eisen read a paper on "The Preservation of Game in the Sierra Nevada."

March 6, 1893. President Harkness in the chair.

Additions to the museum were reported from W. H. Shockley, Mrs. E. L. G. Steele, W. L. Watts, Miss Anna Hewston, J. M. Hahn, C. E. Manning, D. T. Hughes, Captain Praetz, Charles A. Keeler.

The Librarian reported 234 additions to the library.

A vote of thanks was tendered to Mr. D. T. Hughes for his valuable donation of a collection of butterflies from Columbia.

Mr. George H. Ashley read a paper on "An Illustration of the Flexure of Rock."

Dr. H. H. Behr read a paper on "The Relations Between Butterflies and Plants."

Mr. Walter E. Bryant read a paper descriptive of new mammals from Lower California, with exhibition of specimens.

April 3, 1893. President Harkness in the chair.

Dr. J. C. Branner, Prof. J. P. Smith, Mr. Marsden Manson, and Prof. W. R. Dudley, were elected to resident membership.

Additions to the museum were reported from Mr. Stone, William H. Shockley, Walter E. Bryant, E. F. Lorquin.

Two hundred and forty-five additions to the library were reported.

Mr. W. L. Watts read a paper on "Subterranean Air Currents in the Sacramento Valley."

Mr. Walter E. Bryant read a paper on "Notes on the Food of Birds."

Dr. Gustav Eisen made some remarks on a dwarf Chinese lily and spoke on the dwarfing of plants in general.

CALIFORNIA BOTANICAL CLUB. *March 4, 1893.* Miss Manning in the chair.

The following were elected to membership: Prof. Moses Craig, Miss May Belle Church, Miss M. E. B. Norton, Miss Alice Mills, W. Vortriede, H. F. Meier, A. C. Zeig, Miss H. A. Spaulding.

The following were elected officers for the ensuing year:

President—Prof. W. R. Dudley.

Vice-President—S. B. Parish.

Secretary—Frank H. Vaslit.

Treasurer—Miss A. M. Manning.

Librarian—Mrs. K. Brandegee.

Curator—Miss E. G. Britton.

Councilors—Mrs. C. E. Miller, Miss S. W. Scruggs, Miss E. J. Arnold.

The annual report of the Treasurer was read showing $57.25 on hand.

CALIFORNIA ZOOLOGICAL CLUB. *February 3, 1893.* Vice-President, Walter E. Bryant, in the chair.

Officers for the ensuing year were elected as follows:

President—Dr. J. G. Cooper.

Vice-President—Dr. Gustav Eisen.

Secretary—Miss E. A. McIllriach.

Treasurer—T. S. Brandegee.

Curator—E. C. Van Dyke.

Councilors—Miss Emily I. Wade, W. W. Price, Miss Lillie J. Martin, Charles Fuchs.

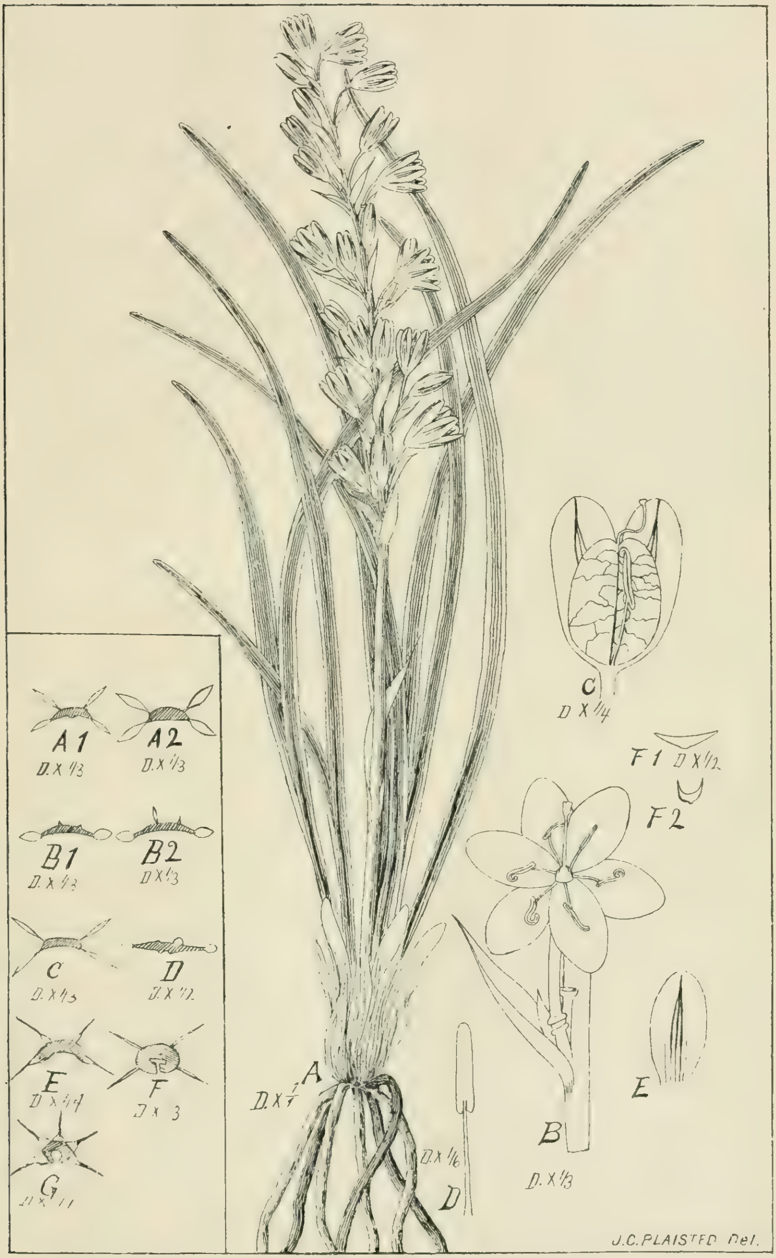
Dr. Cooper read a paper on "The Shells of the Gulf of California."

March 31, 1893. President Cooper in the chair.

Dr. Eisen read a paper on "The Anatomy of Certain Earthworms."

Alphonse de Candolle died on the fourth day April, 1893, in the eighty-seventh year of his age. The whole botanical world feels his loss.

Dr. George Vasey, Chief Botanist of the Department of Agriculture at Washington, died at his home on March 4, 1893. His specialty was Grasses, but he contributed also to other departments of Botany. For twenty-one years he was Curator of the National Herbarium and his influence has been felt throughout the whole country.



CYMOPTERUS. EREMOCRINUM.

PLATE XXVI.

THE HOPKINS SEASIDE LABORATORY.

ZOE
A BIOLOGICAL JOURNAL

VOL. IV. JULY, 1893. NO. 2.

LIST OF PLANTS COLLECTED IN SOUTHEASTERN UTAH, WITH NOTES AND DESCRIPTIONS OF NEW SPECIES.

BY ALICE EASTWOOD.

1. DELPHINIUM SCAPOSUM Greene. Widely distributed through the region. Collected near Moab, along McElmo Creek, and at Mancos.

2. BERBERIS FREMONTI Torr. Collected near Moab, across the Grand River, in fruit. It grows along the rocky sides of the cañon. The plants were covered with a scale insect. The fruit is a berry containing no juice. The loose coat encloses about ten or twelve seeds. It was also collected in flower between Hatch's Wash and Monticello; but the amount of fruit is much less than the quantity of flowers. In the latter locality it grew along cliffs near the bed of streams that in May were dry.

3. ARGEMONE PLATYCERAS Link & Otto. A peculiar, rather sickly-looking plant was collected at Moab, with narrowly oblong leaves, very spiny, but not in the least hispid, flowers not an inch in diameter, fruit also small, but not ripe, and so not in a fit condition to describe.

4. DRABA CAROLINIANA Walt. var. MICRANTHA Gray. Found under sagebrush and piñons from Grand Junction to Mancos.

5. ARABIS PULCHRA M. E. Jones. This was noted in several places along the route. It was collected in a cañon between Hatch's Wash and Monticello.

6. LEPIDIUM MONTANUM Nutt. This grew in abundance in Hatch's Wash under the sagebrush and at other places along the road. I believe, as Professor Jones, that there is no real dis-

tinction between this and *L. alyssoides;* for I find myself always in doubt concerning certain plants.

7. LESQUERELLA MONTANA Watson. This is not uncommon through southeastern Utah, and is usually found under the cedars and piñons.

8. ERYSIMUM ASPERUM DC. A few plants were noticed in a rocky cañon. They had shorter pods than any before seen.

9. SISYMBRIUM LINIFOLIUM Nutt. This was seen here and there through the region, on the mesas.

10. STREPTANTHUS CORDATUS Nutt. This was generally found on cedar-covered mesas.

11. STREPTANTHUS LONGIROSTRIS Watson. Reported in the general notes of a trip through southeastern Utah, Zoe iii, 4, as *Arabis longirostris* Watson. Thompson's Springs. It is common on the adobe desert and also on the mesas.

12. THELYPODIUM AMBIGUUM Watson. Thompson's Springs.

13 THELYPODIUM AUREUM Eastwood. Along McElmo Creek. Most common at Mancos, where the type was collected.

14. BISCUTELLA WISLIZENI Benth. & Hook. On a sandy flat in Court House Wash, and along McElmo Creek in a similar situation.

15. CLEOMELLA PLOCASPERMA Watson. The stamens surpass the petals, the pedicels are horizontal and about as long as the deflexed stipe, the seeds are not tessellated, but may not be sufficiently ripe. In all other characteristics it resembles the above-named species. It is not *C. oöcarpa* as that species is represented in the Herbarium of the California Academy of Sciences. Collected between Thompson's Springs and Moab.

16. POLYGALA ACANTHOCLADA Gray. This spiny plant was collected in Montezuma Cañon on a rocky hill.

17. MALVASTRUM LEPTOPHYLLUM Gray. Collected in Court House Wash and along McElmo Creek.

18. SPHÆRALCEA MUNROANA Spach. Collected after leaving Moab, a form with light pink flowers. The red-flowered form is common through the whole region.

19. LINUM RIGIDUM Pursh. This was quite abundant in the sandy bottom near the Grand River. It has taller and more diffuse stems than the Grand Junction plant, and the flowers are larger and lighter in color.

20. GLOSSOPETALON SPINESCENS Gray. This is not plentiful in any one locality, but seems to be widely distributed through the section.

21. NEGUNDO ACEROIDES Moench. Common along Montezuma Creek, but not at the lower end.

22. RHUS CANADENSIS Marsh. This differs from the ordinary form of var. *trilobata* in that the leaves are simply crenate. It was collected in Court House Wash.

23. ASTRAGALUS AMPHIOXYS Gray. Court House Wash, McElmo Creek, and Montezuma Cañon. The most widely-distributed Astragalus of the region.

24. ASTRAGALUS BIGELOVII Gray. Usually found on piñon and cedar covered mesas.

25. ASTRAGALUS GEYERI Gray. Court House Wash.

26. ASTRAGALUS HAYDENIANUS Gray. Montezuma Creek.

27. ASTRAGALUS LONCHOCARPUS Torr.(?) Court House Wash.

28. ASTRAGALUS SCAPOSUS Gray. McElmo Creek.

29. ASTRAGALUS PICTUS Gray var. ANGUSTUS Jones. Montezuma Creek.

30. ASTRAGALUS PREUSSII Gray. Common at Moab.

31. ——— var. SULCATUS Jones. Cane's Spring.

32. ASTRAGALUS DESPERATUS Jones. McElmo Creek; San Juan River.

33. ASTRAGALUS PALANS Jones. Montezuma Creek.

34. ASTRAGALUS COLTONI Jones. Court House Wash.

35. ——— var. FOLIOSUS Jones. This is the form found at Monticello. It was collected in flower and green fruit.

36. ASTRAGALUS PATTERSONI Gray. This species seems to be widely distributed on the western slope, growing in alkaline soil.

37. CÆSALPINIA repens n. sp. Perennial, 9 to 13 cm. high, from slender, woody, creeping rootstocks; leaves and peduncles crowded on a short stem, canescent with short, curled hairs; leaves with from 5 to 7 pinnæ, leaflets 4 to 6 closely appressed, nerveless, with a few scattered, depressed glands varying in shape, usually irregular in outline (many leaflets are without the glands); stipules ovate-acuminate, petioles ribbed, a little longer than the blade, with several long, lax bristles where the pinnæ join the axis, and one at the base of each leaflet; peduncles stout, ribbed, surpassing the leaves, covered closely with the short, white hairs, and with occasional longer ones similar to the lax bristles on the leaves; flowers at first erect, closely clustered, pedicels becoming deflexed and distant in the fruiting, elongating raceme; four upper sepals lanceolate, lowest oblanceolate, covered with longer white hairs than the rest of the plant; without glands, as is also the corolla; petals surpassing the sepals, obovate, tapering to the short claw, 8 to 12 mm. long, 3 mm. broad, smooth except the vexillum, which has a broad, hairy claw; stamens with filaments about 10 mm. long, broadening at base, smooth above, ciliate with blunt, coarse hairs below, densest at the base; style cylindrical, broadening at the base, and to a less degree at the ciliate campanulate stigma, which is slightly hairy below; legume at first canescent with short, curled hairs, orbicular to obovate; in age with hairs so scattered that it is no longer canescent, becoming reticulate with prominent transverse veins, flat, with a thickened margin, varying from orbicular to elliptical and oblong, usually abruptly pointed with the persistent style, entirely without glands, 1½ to 3 cm. long, 1½ to 2 cm. broad; seeds usually two. This grew in sandy soil, and formed loosely-spreading mats. It was collected in Court House Wash, near where it comes into the Grand River, on the opposite side from Moab, in southeastern Utah, May 26, 1892.

The pod is very different in appearance from that of others of this genus. The character of its glands excludes it from the sections proposed by E. M. Fisher in his recent revision of Hoffmanseggia. Since he has with good reason reduced Hoffmanseggia to Cæsalpinia in Bot. Gaz. xviii, 4, this Utah plant

which by the old classification would be Hoffmanseggia becomes Cæsalpinia. Plate XXVI.*

38. LATHYRUS PALUSTER L. Along the bottom of Montezuma Creek.

39. LUPINUS SHOCKLEYI Watson. Scarce. On the road from Thompson's Springs to Moab.

40. LUPINUS PUSILLUS Pursh. Abundant. But not seen after leaving Moab.

41. PSORALEA CASTOREA Watson. Along the side of a sandy wash.

42. TRIFOLIUM PLUMMERÆ Watson. Under the cedars and piñons at the head of Montezuma Cañon.

43. AMELANCHIER ALNIFOLIA Nutt. This is a peculiar form of this widely distributed species, collected in Court House Wash. It differs from the form common in Colorado, in the leaves smaller, less veiny, and more glossy on the upper surface, the branches are straggling, flowers and leaves few; so that the observer is first attracted to the difference by the less compact form of the Utah variety.

44. CERCOCARPUS PARVIFOLIUS Nutt. Near Monticello.

45. COWANIA MEXICANA D. Don. On rocky hills and mesas.

46. PRUNUS DEMISSA Walt. In deep cañons near water.

47. PURSHIA TRIDENTATA DC. Common on the hills and mesas, but less so than in Colorado.

48. ŒNOTHERA PINNATIFIDA Nutt. Thompson's Springs.

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* EXPLANATION OF PLATE XXVI.

CÆSALPINIA REPENS: "A" longitudinal section of the pistil enlarged four times, showing the arrangement of the ovules; "B" the same showing the ciliate, sparingly hairy stigma; "C" stamen enlarged four times showing the peculiar hairs on the filament; "D" anther enlarged; "E" petals spread out, enlarged twice; "F" calyx spread open, enlarged twice; "G," "H" pods nearly ripe to show difference in shape; "I" end of pod enlarged to show the venation; "J" a piece of the stem near the base to show the ribs and little spines; "K" leaf enlarged showing inner and outer surface; "L" another leaf enlarged much more showing the glands and hairy surface.

49. Œnothera cardiophylla Torr. Near Moab.

50. Œnothera scapoidea Nutt. Thompson's Springs.

51. Œnothera trichocalyx Nutt. Thompson's Springs, and in other places along the route. The notes on the species of this genus were published in Zoe, vol. iii, No. 3.

52. Mentzelia multiflora Gray. In bloom in the evening along the sandy bottom of Court House Wash; the flowers were all closed the next morning.

53. Echinocactus Whipplei Eng. & Big. On the road to Monticello not far from Window Rock.

54. Opuntia Missouriensis DC. Court House Wash. This was a rare plant and a peculiar form with long, very slender white spines.

55. Cymopterus purpureus Watson. In Montezuma Cañon on a rocky hillside. At Durango it grows under the piñons.

56. Cymopterus montanus T. & G. This is the rather tall form found also at Grand Junction and Durango. On alkali deserts not uncommon.

57. Coloptera Newberryi C. & R. In Court House Wash, and on a mesa after leaving Moab. It seems to approach Cymopterus, and the spongy wings ought not to be regarded as a generic difference since there are often both flat and spongy wings on the same fruit.

58. Galium Mathewsii Gray. This diœcious Galium is widely distributed through this region and no special locality was noted. It usually grows on the sides of cañons or gulches.

59. Brickellia microphylla Gray. Court House Wash, along the cañon walls; a fall bloomer.

60. Brickellia linifolia Eaton. Court House Wash, in the same locality as the above. In bloom in May.

61. Aplopappus armerioides Gray. Found under piñons and cedars.

62. Aplopappus spinulosus DC. This form with unusually large flowers and erect stems grows along by McElmo Creek. The species is variable.

63. TOWNSENDIA STRIGOSA Nutt. Common on the road to Moab and along McElmo Creek.

64. TOWNSENDIA FENDLERI Gray. Usually found growing on mesas through the whole region.

65. ASTER FRONDOSUS T. & G. Court House Wash.

65*a*. ASTER TORTIFOLIUS Gray? There are no glandular hairs or viscidity about this plant as in *A. tortifolius* and *A. Wrightii*, but it differs more essentially from *A. venustus* which it resembles in shape of leaves and manner of growth, though not so stout. It differs from *A. venustus* in the depressed hairs of the akenes which are pappus-like at the top, the ray flowers are violet with a hairy tube, akenes about half as long as in *A. venustus*, truncate instead of obovate, style branches about one-quarter as long. This with *A. Wrightii*, *tortifolius*, and *venustus* form a well-marked group, and future material and investigation may resolve them into one species.

66. ASTER TANACETIFOLIUS HBK. Thompson's Springs.

67. ERIGERON BELLIDIASTRUM Nutt. Along the road to Moab.

68. ERIGERON UTAHENSIS Gray. This sends up numerous branches from a woody stem. It was coming into bloom and seemed rare. Court House Wash, near the Grand River.

69. BACCHARIS SALICINA T. & G. On the banks of the Grand River near Moab.

70. ENCELIA NUTANS Eastwood. On the road between Thompson's Springs and Moab.

71. ENCELIA FRUTESCENS Gray. Along the walls of the cañon approaching the Grand River near Moab.

72. BAHIA NUDICAULIS Gray. Along McElmo Creek.

73. CHÆNACTIS STEVIOIDES Hook. & Arn. Common through the entire region. Sometimes becoming large, diffusely branching plants.

74. TETRADYMIA SPINOSA Hook. & Arn. Widely distributed. Thompson's Springs.

75. SENECIO AUREUS L. var. This variety is common under cedars and piñons in Western Colorada and Eastern Utah.

76. CNICUS NEO-MEXICANUS Gray. Abundant and conspicuous on hills along McElmo Creek.

77. STEPHANOMERIA EXIGUA Nutt. Near Moab. It opens in the early morning and closes before noon.

78. MALACOTHRIX TORREYI Gray. Common throughout the section.

79. GLYPTOPLEURA MARGINATA Eaton. Moab near the Grand River.

80. LYGODESMIA EXIGUA Gray. Along McElmo Creek, growing on a sandy hill.

81. FORESTIERA NEO-MEXICANA Gray. Growing in clumps along the San Juan River.

82. FRAXINUS ANOMALA Torr. Court House Wash.

83. AMSONIA BREVIFOLIA Gray. On the hillsides at Moab.

84. ASCLEPIAS CRYPTOCERAS Watson. This beautiful Asclepias was occasionally seen on the sides of washes. It is not common.

85. ASCLEPIAS INVOLUCRATA Engelm. var TOMENTOSA n. var. This differs from the description of the species and from specimens in the Herbarium of the California Academy of Sciences in the following characters: Tomentose throughout, leaves ovate-lanceolate, acuminate, sometimes orbicular; margins wavy and densely tomentose from 3 to 7 cm. long and from 1 to 2 cm. broad at base. Umbel closely sessile with involucral leaves, densely white-tomentose and linear-lanceolate. There is, however, but little or no difference in the flowers. It grew along Court House Wash and the San Juan River near McElmo Creek, and was alike in both localities.

86. FRASERA ALBOMARGINATA Watson. This was seen growing on a piñon covered mesa along Montezuma Creek. It also grows in the same kind of a place on Mesa Verde in southwestern Colorado. It was not yet in bloom.

87. FRASERA PANICULATA Torr. (?) This was not collected as the plants were not yet in bloom. It was tall, loosely and paniculately branched and the memory of its appearance agrees

with the general description of the above species. It may be *F. Utahensis* Jones.

88. GILIA CONGESTA Hook. The plants collected in Utah, between Hatch's Wash and Monticello, grew on a piñon covered mesa and differed in the following points from the Grand Junction form, which grew in a dry water course: The Utah form has smaller flowers with corolla tube equaling the calyx. The Grand Junction form has the corolla tube twice as long as the calyx. The ovules are less numerous in the Utah form. Both have the corolla lobes from entire to tridentate, at the apex.

89. GILIA LONGIFLORA Don. This was collected in Hatch's Wash with the tube of the corolla more than inch long.

90. GILIA PUNGENS Benth. This is the large white-flowered form with very small leaves in interrupted fascicles. In Montezuma Cañon.

91. GILIA INCONSPICUA Dougl. Near Moab and along McElmo Creek.

92. GILIA LEPTOMERIA Gray. Collected at Moab. This seems very near to *G. inconspicua*.

93. GILIA GUNNISONI T. & G. Common in Court House Wash.

94. GILIA TRIODON n. sp. Annual, from ten to twenty cm. high, branching diffusely upwards from the base with numerous slender branches, stipitate glandular throughout except the parts of the flower within the calyx, leaves clustered at the root, thickish, runcinate pinnatifid into nine or ten divisions, which are either entire or dentate, the teeth often tipped with short bristles; stem leaves bract-like, diminishing upwards; small flowers numerous scattered along and terminating the branchlets; calyx campanulate, two to three mm. long, cleft half way down with five or sometimes six green tipped bristle-pointed lobes, the membranous lower part folding in like a fan; corolla minute, salver-form, the tube exserted, tapering from a broad base to the throat, divisions tridentate, with middle tooth longest, and the sinuses rounding, minutely tuberculate; stamens with slender filaments and cordate acuminate anthers; pistil with the stigma

club-shaped, obscurely tridentate; ovules numerous; capsule slightly surpassing the calyx, seeds tuberculate developing spiricles and mucilage. In habit this seems to belong to Eugelia; but it differs from all described Gilias in having no style branches, but instead a club-shaped tridentate stigma. Collected June 20, 1892, in Ruin Cañon, a branch of the McElmo and near the boundary line between Colorado and Utah. It was named from the appearance of the stigma and petals.

95. GILIA SUPERBA n. sp. Stems one or several from a woody tap root, each with a rosulate cluster of leaves at base, cymosely branched above, or even diffuse from near the base; glutinous throughout; radical leaves varying from spatulate and entire to obovate-cuneate, with margins crenately to incisely dentate, with apiculate teeth, tapering into margined petoiles, which are often purplish on the mid-nerves and at the base; 3 to 5 cm. long; cauline leaves few and scattered, sessile, incisely dentate, small, and decreasing upwards into linear-subulate bracts; flowers clustered at the ends of the long, almost naked peduncles, on pedicels equalling or shorter than the calyx; calyx open campanulate, the five triangular-acute lobes about equalling the tube, purplish, dotted with stipitate glands; corolla crimson, velvety in texture, salver-form; tube about three times as long as the calyx, widening upwards, lobes obovate, shorter than the tube, about 5 mm. broad; stamens equally inserted and wholly included; style as long as the corolla tube, surpassing the stamens; ovules numerous (about fifty); immature seeds irregular in shape, with a loose, crumpled outer coat, fewer than the ovules. (Plate XXVII.)

This beautiful and showy Gilia belongs to the section Ipomopsis, and comes nearest to *G. Haydeni*, with which it has been directly compared, not only with specimens from the type locality, but also with the type itself, in Mr. Brandegee's Herbarium. This is either a winter annual or a biennial, while *G. Haydeni* is perennial, the cauline leaves are more bract-like and fewer, it is less diffuse but taller, larger, and much more glutinous, the calyx is more spreading and with the lobes not membranously margined; the stamens of *G. Haydeni* are protruded beyond the tube, and the stigma is below them; in *G. superba*

the opposite is the case; the ovules are much more numerous in this species, and shaped differently.

The plants were collected at Hatch's Wash, in southeastern Utah, between Moab and Monticello, on May 29, 1892. They were abundant in a limited area, on sandy knolls formed by the accumulated sand that had been washed down from the basin-like sides of the shallow cañon, and were not met with at any other place.

96. PHLOX NANA. Growing at the base of a cliff between Hatch's Wash and Monticello.

97. PHACELIA NUDICAULIS n. sp. Annual, low, and almost prostrate, stems several (4–7) from the root, naked to the inflorescence, nodes 1–2 cm. long, internodes shorter; glandular and hirsute, with short, white bristles; leaves thick, orbicular, or broadly ovate, abruptly tapering to the petiole, blade about 1 cm. long by not quite so broad, petiole equalling or surpassing it in length, margins slightly undulate and revolute; radical leaves few; cauline, crowded at the ends of the branches, surrounding and almost hiding the flowers, which are solitary in the forks of the branches or in few flowered spikes which are cymosely arranged; sepals linear-spatulate, united at base, spreading, and surpassing the capsule; corolla 3 to 5 mm. long, surpassing the immature calyx, violet, tubular funnel-form, with rounding lobes acute or obtuse, hairy on the outside but smooth within, the folds at the base linear and attached to the stamens; filaments smooth, equally inserted, but of unequal lengths; style cleft half-way down, with capitate stigmas, hairy to the forks; capsule blunt, hairy; seeds about 16, oblong, pitted, variable in thickness, from flat to lens-shaped, probably modified by the pressure from each other in the crowded cells.

This desert Phacelia was collected on the road from Thompson's Springs to Moab, May 24, 1892. It grew on a flat, adobe desert with *Cleomella plocasperma* (?), and was abundant over a very limited area. It most nearly approaches *P. cephalotes* Gray, from which, however, it is quite distinct.

98. PHACELIA CEPHALOTES Gray. This presents some very interesting variations in the style branches. In some flowers it

is undivided and capitate, in others with two distinct capitate stigmas, while in others the styles are distinct for about 1 or 2 mm. The calyx and corolla often have six divisions; the seeds are honeycombed. Collected on a sandy flat in Montezuma Cañon, June 1, 1892.

99. PHACELIA CRENULATA Torr. Moab. This is very common also at Grand Junction on the mesas.

100. CONANTHUS ———. Collected at Thompson's Springs May 23, 1892. This is similar to the plant distributed by Wm. C. Cusick and named by Dr. Gray *C. parviflorus*; but it was never published.

101. COLDENIA HISPIDISSIMA Gray. On the hills around Moab and in Court House Wash.

102. KRYNITZKIA LEUCOPHÆA Gray. Common on mesas through the whole region.

103. KRYNITZKIA PTEROCARYA Gray. Near Moab.

104. KRYNITZKIA ————. Court House Wash. This is left undescribed and undetermined until time can be given to a most interesting collection of this genus.

105. DATURA METELOIDES DC. Common in the dry bed of McElmo Creek and along the banks.

106. LYCIUM PALLIDUM Miers. Montezuma Cañon near the San Juan River and McElmo Cañon. This prevailed in occasional tracts.

107. NICOTIANA ATTENUATA Torr. Ruin Cañon. Widely distributed.

108. CHAMÆSARACHA CORONOPUS Gray. Montezuma Cañon and where the McElmo joins the San Juan. The star-like flowers open towards evening.

109. PENSTEMON EATONI Gray. Court House Wash and other cañons on the road. This is one of the most showy penstemons and worthy of cultivation.

110. PENSTEMON UTAHENSIS n. sp. Stem erect, one or several from the root, one to two feet tall, glaucous and glabrous throughout; radical leaves from spatulate, about two cm. wide,

to oblanceolate, five to eight cm. long by one cm. wide; slightly wavy; stem leaves far apart, about eight cm. between the lowest pairs, less above, oblong, sessile by a clasping base, diminishing upwards; flowers in an interrupted loosely and few flowered thyrse; calyx small, divisions abruptly pointed and thicker at the apex; corolla funnel form, two cm. long, lobes large, orbicular and spreading, three to five mm. broad, carmine; two stamens inserted at the base of the carolla; the others even with the sterile filament which is hooked at the glabrous end; style broadening to the paddle-shaped stigma and to the pointed ovary.

Were it not for the tip of the sterile filament this would unhesitatingly be placed with *P. Parryi*, but if that distinction is worth anything it must belong to the next group near *P. grandiflorus* which it is as unlike in all the other characteristics whereby it resembles *P. Parryi*. It is a beautiful and showy plant. The very glaucous foliage softens the bright carmine flowers which are velvety in texture and of beautiful shape with the round evenly spreading lobes of the funnel form corolla. It was collected between Hatch's Wash and Monticello, May 28, 1892; also on the San Juan River near where McElmo Creek enters.

111. APHYLLON MULTIFLORUM Gray. Along McElmo Creek, June, 1892.

112. POLIOMINTHA INCANA Gray. This was collected in Court House Wash on the Sandy Flat near the Grand River. It has a large prostrate woody stem and usually forms a knoll, from the sand collecting around its firm base. The numerous branches are slender and erect; the foliage is silvery canescent and the flowers a lovely blue. It has a sweet perfume.

113. HEDEOMA DRUMMONDII. In a branch of McElmo Cañon.

114. ABRONIA TURBINATA Torr. Thompson's Springs.

115. ABRONIA MICRANTHA Torr. Thompson's Springs and on the road to Moab.

116. ABRONIA CYCLOPTERA Gray. In the same localities as the two above; but more abundant than either.

117. Atriplex argentea Nutt. Along the San Juan River and elsewhere.

118. Atriplex Nuttallii Watson(?). This differs somewhat from the species and may be new. The material is hardly sufficient for satisfactory determination.

119. Grayia Brandegei Gray. Blooming plants were collected on a hill near McElmo Creek. They were not far enough advanced for good specimens but could be distinguished from the Atriplex which they resemble.

120. Grayia polygaloides Hook. and Arn. Common at Thompson's Springs. A form with very large fruit was found near McElmo Creek.

121. Sarcobatus vermiculatus Torr. Widely distributed along streams. Montezuma Creek.

122. Eriogonum Thomasii Torr. Court House Wash, near Moab, growing along the rocky cañon walls.

123. Eriogonum inflatum Torr. Common on the desert plains and the cañon sides. It is called trumpet-weed at Moab. The inflation is almost globular in the plants of the plains, but long and narrower on the hill-side forms, which also grow much taller than the others. The inflated portion is empty, not containing a drop of moisture. Growing with the inflated plants are many smaller plants destitute of the swelling.

124. Eriogonum glandulosum Nutt. Montezuma Creek.

125. Eriogonum divaricatum Nutt. Montezuma Creek.

126. Eriogonum salsuginosum Nutt. Montezuma Creek.

127. Rumex venosus Pursh. Near the spring on the road to Moab.

128. Euphorbia flagelliformis Engelm. Young plants of this were coming up, the old ones were near by, the dry stems containing fruit, so the species could be determined from all the material. Near the Grand River, in Court House Wash, and on the San Juan flats.

129. Celtis occidentalis L. Along McElmo Creek and in the branch cañons.

130. QUERCUS UNDULATA Torr. There were two distinct forms or two species. One had deciduous leaves, the other evergreen. They grew together in Hatch's Wash.

131. SALIX ———. This was not collected, for it was out of flower and fruit.

132. POPULUS AUGUSTIFOLIA James. Montezuma Cañon.

133. ALLIUM NEVADENSE Watson (?). This was collected on a mesa between Cane's Spring and Hatch's Wash. It also grows at Grand Junction, and is distinguished chiefly by an offshoot from the veiny-coated bulb.

134. CALOCHORTUS NUTTALLII Torr. & Gray. Montezuma Cañon.

135. CALOCHORTUS FLEXUOSUS Watson. Along McElmo Creek.

136. HESPERANTHES ALBOMARGINATA Jones. On the road to Moab in a desert flat.

137. BLEPHARIDACHNE KINGII (Watson) Hack. This is *Eremochloe Kingii* Watson of King's Report.

138. STIPA PENNATA L. var. NEO-MEXICANA Thurb. On the mesas near McElmo Creek.

139. EPHEDRA TRIFURCA Torr. In a cañon between Hatch's Wash and Monticello. Collected in good fruit.

140. JUNIPERUS OCCIDENTALIS Hook var. MONOSPERMA Eng. The common Juniper or cedar of the mesas.

141. PINUS EDULIS Eng. The piñon or nut pine, found usually with the Juniper named above.

These were all noted or collected on the trip from Thompson's Springs to McElmo creek at the Utah line. Many extended also into Colorado; for state lines make no difference in the flora. However, as the list is headed "Utah Plants," it is best to stop at the boundary line. The route was from Thompson's Springs to Moab, from there by way of Hatch's Wash to Monticello, then down Montezuma Cañon to the San Juan River, and thence up the McElmo. The time was between May 24 and June 3, 1892. The general description of the country was given in Zoe iii, 4.

DESCRIPTION OF A LUMINOUS LARVA FOUND NEAR HOLBROOK, ARIZONA.

BY C. H. TYLER TOWNSEND.

On the night of June 27, 1892, while camped about five miles west of Holbrook, Arizona, I found a luminous larva running over the ground. The prothoracic segment was especially and continuously luminous, while the other segments, especially the more terminal ones, were all more or less so. Each segment was luminous for a certain space about the centre of its dorsum, and thus taken together they looked like a string of beads in the dark, the prothorax, however, being wholly luminous.

The larva is coleopterous. It does not much resemble an elaterid larva, while it is equally unlike a lampyrid. It differs in its shape, and also very markedly in its characters, from the supposed larva of *melanactes* figured by Riley and described by Bethune and Osten Sacken.* It further differs very strikingly by the luminosity not being located in the same regions of the larva as those indicated in the figure above referred to. Instead of being at the side of each segment, and at the incisures, the centre of the segments is luminous, according to my notes. These notes on the luminosity of the larva were made in the field at the time, and the details have since escaped my memory. But I do not think that I mistook the incisures for the segments.

Description of larva. Length, hardly 12 mm.; greatest width (segs. 9-10), 1¾ mm. Whitish in color originally; changed by immersion in alcohol to a pale rufous above and pale flavous below. Elongate, of nearly equal width, but slightly narrowed anteriorly, and posteriorly flattened. Consisting of thirteen segments, rather chitinous on whole surface, especially on dorsum, head, and ventral thoracic portion. Head retracted within the prothoracic segment, the third to twelfth segments each retracted for about its anterior one-third within the next segment anterior to it. Second or prothoracic segment elongate, longer than any of the other segments, gradually narrowed

* Riley, Amer. Ent., iii, 202; and LeBaron, 4th rep., 99.—Bethune, Can. Ent., i, 2.—Osten Sacken and Bethune, Can. Ent., i, 38–9.—Osten Sacken, Proc. Ent. Soc. Phil., 1862, 125, pl. 1, f. 8; and iv, No. 2, 8.

anteriorly where it is but little wider than the head. Segments three to eight equal in length, each hardly two-thirds length of second, very gradually widening to eighth, which is but little wider than three; segments nine to twelve a little longer, hardly wider than others; thirteen a little longer than twelve, not as long as second, a little narrowed and rounded off behind, with a segment-like anal joint or appendage which shows very plainly on the ventral surface, making the larva appear fourteen-jointed, and is doubtless homologous with the so-called anal proleg, though it does not appear to possess this function in the present case. All the joints except head covered dorsally with fine short posteriorly directed bristly hairs, longer and directed more outwardly on sides, extending down on lateral ventral surface; median ventral surface less distinctly short hairy except on thoracic segments. Head bears some bristly very short hairs on edges. A moderately large black convex simple eye on outer anterior edge of head, rather prominent, partially hidden by the head being retracted within the overlapping anterior dorsum of prothorax. Antennæ short, situated just anterior to and inside of eyes; basal joint stout and rather tubercular, second joint smaller, about as wide at base as long, subconical, bearing some bristly hairs; third joint minute, as long as broad, terminated by a few short hairs. Mandibles apparently single-toothed, blackish, curved, and rather claw-like, not stout. Maxillæ two-jointed, stout, the joints rather cylindrical; second joint as long as wide, but narrower than the basal. Maxillary palpi small, apparently two-jointed, the second joint but little smaller than the basal. Labial palpi very small, slender, two-jointed, the joints short and subequal; an anterior prolongation of the labium between them surmounted by two fine hairs. Prothoracic segment deeply notched anteriorly below with a V-like fold of the integument extending not quite to its posterior margin, exposing what seems to be a separate sclerite belonging to the prothoracic segment. Spiracles situated about middle of lateral edges of segments five to twelve inclusive, but appearing anterior to middle when the segment is retracted. Legs apparently four-jointed, basal joint elongate, appearing as a prolongation of the integument; second joint short, about one-half

as long as basal joint, third and fourth joints about equal in length, twice as long as second, the fourth tapering to its extremity, which is terminated by a slightly curved, rather elongate chitinous claw or hook. The last three joints of the legs are furnished with a sparse fringe of small bristly spines on inside.

Described from one specimen. Arizona.

A luminous larva was reported to me, in the spring of 1892, as numerous in the Mimbres country, in Grant County, New Mexico. No specimens, however, were obtained.

NOTES ON THE FLORA OF GUADALUPE ISLAND.

BY F. FRANCESCHI.

The Island of Guadalupe has been botanically explored first in 1875 by Dr. Edward Palmer, and second by Prof. E. L. Greene in 1886, Dr. Palmer having made a short visit there and collected again in 1889. For a newcomer there was in consequence but little hope to find anything that had escaped such experienced and diligent observers; the more so as it was well known that the work of extermination of that most interesting flora, due to the wonderful increasing of wild goats there, had gone on unabated these last ten or twelve years. My purpose in visiting the island, rather than the hope of adding to the number of the plants registered already by Dr. Palmer and Prof. Greene as belonging to Guadalupe, was to gather more information on the present state of vegetation on the island, and full particulars on the appearance, the habit, the flowering, and fruiting of many of the trees and shrubs peculiar to Guadalupe, of which a few have been sparingly introduced in gardens, and others well deserve to be. For detailed accounts on the palm, the cypress, the pine, and the oak of Guadalupe, as well as on the most noteworthy shrubs, I must refer to papers sent to "Garden and Forest," of New York, and to the "Gardener's Chronicle," in London. A few remarks of a more general character will, I hope, be found of interest as preceding the list of plants I was able to collect there during December and part of January last.

The Island of Guadalupe, situated between 29 degrees latitude north, and about 150 miles west of the coast of Lower California, measures nearly nineteen miles in length from north to south, by six to seven in breadth. The highest peak, Mount Augusta, reaches 4,500 feet, but is hardly to be noticed as it stands near the centre of the island, only a few hundred feet higher than the surrounding plateau. Guadalupe is not exactly a table-land, as it has been described, but rather a succession of several plateaus at different altitudes, of ridges, of old craters, and of powerful lava dykes appearing to have sprung out from various points and flown in every direction. The volcanic action which formed the island—now entirely subsided, there being no trace of thermal waters nor of gaseous emanations of any description—must have been grand and powerful indeed, if one considers the remains of the circus of the primitive crater in the north part of the island, rising to more than 3000 feet above the sea level and fully four miles in diameter. Two-thirds of this circus still exists, the eastern part of it having been swallowed by the ocean in some later convulsion, and at the southern part, towards the centre of the island, this high ridge blends with the plateau where Mount Augusta rises, this last offering no trace of eruptive crater, but of having given birth to immense currents of lava, most of them now covered with cypresses.

The standing portions of the circus emerging from the sea on the north and northwestern side of the island are exceedingly steep and precipitous, cut by a few deep cañons, and with some adventitious and comparatively small cones of eruption. Just on the slope of one of them is to be seen the principal grove of palms (*Erythea edulis*) with a few intermingled fine specimens of oaks and many more pines, the latter extending all over the northern part of the island, which in times past they must have covered with a very thick forest. The immense crater was once filled up to the height of 2000 to 2500 feet, and a section of this plateau remains still unaltered in the shape of a crescent, its surface rising gently from north to south. Here are to be found the sole appreciable springs of water, evidently nourished by the fogs that at all seasons are very often brought by the predominating northwest winds against the high overstanding ridge and

there deposited. The few scattered pines still living on the ridge afford a fine example of the power of trees in condensing and storing water. When a strong wind blows the fog up from the ocean, while the surrounding ground looks hardly wet, under the pines it will be pouring hard with streamlets of water running from the base of their trunks. For this peculiar office the acicular leaves of the pines are eminently adapted, and one can easily understand that when all the northwestern part of the island was clothed with a dense pine forest, springs must have been much more abundant, and the vegetation on the eastern side must have largely benefited by them. The springs are not far from each other and nearly in the centre of them are the cabins built a few years ago by the International Company of Lower California, which has since abandoned the lease of the island as unprofitable.

The increase in the number of wild goats has gone on these last years unchecked by the few thousand which may have been killed by the poachers who visit the island from time to time. The result is vividly shown by the fact that in all my ramblings over the island I was unable to find but one single shrub, *Ceanothus crassifolius*, alive in any of the places inaccessible to goats. Endowed as these are with proverbial climbing ability, the more so when pressed by hunger, the few plants that have escaped destruction are those growing on the perpendicular basaltic cliffs, accessible only to winged creatures, and old trees with bark too hard and woody to offer any food. Most of the shrubs and perennials seem not to be much adapted to assume a "rupicole" habitus, seedlings being exceedingly scarce, so that in a few years' time many of the species, represented now by a very limited number of individuals, will be entirely lost. The same fate, in a longer period, is likely to be shared by the trees of which at present only the cypresses and palms are growing in large numbers, no reproduction being possible, as all seeds falling to the ground are devoured by goats or by mice. It is wonderful to see how kids a few months old, far from starving, are able to break and chew the kernels of the palm, hard as marble as they are. Anyone who has traveled along the Mediterranean basin, especially in some parts of Turkey and

Greece, must have acquired a fair idea of the destructive power of goats; but what is to be seen in Guadalupe far surpasses any anticipation.

It would appear at first that annuals, unprovided by nature with a perennial or woody axis, ought to have been the first to disappear; but just the contrary has happened, probably owing to the circumstance that the cycle of evolution of an annual plant (more so in such a dry region) is exceedingly short, and coincides with the period of most plentiful production, so that there is much more chance of the ripening of an abundant crop of seed which, by its minuteness and unattractiveness, escapes destruction and assures a large reproduction of the species. Shrubs and perennials are exposed all the year round to the destructive teeth of the goats, and it is a well-known fact that no matter how hard and enduring the vitality of such plants, in the long run they are unable to survive the constant clipping of their aerial parts.

Among the plants collected by myself in Guadalupe, annuals could not be numerous, owing to the season of the year, and very little was added to the island record. I was able, however, to secure a small plant of what appears to be a Heuchera, probably the unidentified species collected, in 1875 only, by Dr. Palmer, and a plant also of a Cotyledon—no species being described from the island. Among cryptogamous plants *Parmelia physodes* L. var. *enteromorpha* Tuck., *Usnea barbata* L., *Ramalina homalea* Ach. are not to be found in the already published lists; all of them are known, however, on the mainland of California.

The figures following the species are the serial numbers of the collection.

Crossosoma Californicum Nutt. Only one specimen found with few flowers; in bloom about the middle of December. Growing on the almost inaccessible cliff of the lower circus east of the cabins. (42.)

Eschscholtzia Californica Cham. Plentiful in the same limited locality pointed out by Prof. Greene; positively perennial; its leaves clipped pretty closely by goats. (19.)

Eschscholtzia elegans var. *ramosa* Greene. Rather plentiful not only along the beach north of the landing, as noticed by

Prof. Greene, but also in the dry bed of the cañon and on the bare dry rock at the mouth of it, and a single specimen found on the ridge of the lower crater about the centre of the island east of Mt. Augusta. All these plants appear to be annual, but apparently the same species grows luxuriantly as a perennial on a nearly inaccessible cliff of lava detritus on the right bank of the cañon 500 or 600 feet from the landing. These plants were already in flower at the beginning of January. The flowers have no greenish tinge at all; petals not over two-thirds of an inch long. (20.)

Oligomeris subulata Boiss. Cañon near the landing. (64.)

Lepigonum macrothecum F. & M. Seen only on a perpendicular cliff on the right bank of the cañon, not far from the landing; growing there in number. Specimens of a Silene—dried stocks of the preceding year were abundant near the landing. (29.)

Claytonia perfoliata Donn. Quite common from centre to north, most luxuriant under the palms where it was in flower early in December. (53.)

Lavatera occidentalis Wats. A few scattered specimens, all on the most inaccessible rocks east of the island. A few seedlings not likely to survive found in several localities. (12.)

Malva borealis Wallm. Now a common weed; apparently not liked by the goats. (54.)

Sphæralcea sulphurea Wats. Much more abundant than Lavatera, one of the very few plants of which some meager specimens may be seen scattered about even in places occasionally visited by goats. Seedlings and young plants observed near the landing both on the beach and on the dry lava rock. (13.)

Erodium moschatum L'Her. Plentiful all over, chiefly among rocks and stones; not so much so, however, as *Erodium cicutarium* which now literally covers the whole surface of the island. *E. moschatum* appears not to be liked by goats, at least where other food is obtainable. (22.)

Ceanothus crassifolius Torr. Twelve to fifteen feet high. Only one plant found alive near the centre of the island west of Mount Augusta, among the cypresses, but surrounded by what appear

to be the dead stumps of thousands of its brethren, which must have formed a thick and general underwood not only in the larger cypress grove, but also in the smaller near the springs and cabins. Later three or four more living plants were found in the upper grove. (6.)

Rhus laurina Nutt. Probably the same four plants seen by Dr. Palmer, growing not far apart on the basaltic cliff east of the cabins. Another specimen too high up to be surely identified was seen on the right bank of the cañon near the landing. (9.)

Lupinus niveus Wats. Apparently annual, a few seedlings found in different localities, but chiefly on the flat ground next to the large spring south of the cabins. (23.)

Trifolium amplectens T. & G. Seen only in the cañon near the landing, but not in large numbers. (26.)

Trifolium Palmeri Wats. In the same locality, but much more abundant. (27.)

Hosackia argophylla Gray. Very few seedlings, observed only on the beach north of the landing. (24.)

Heuchera ———. Single specimen not in flower.

Cotyledon ———. Only one small plant on a rock along the trail not far from the landing.

Echinocystis Guadalupensis Naud. Seen only among rocks on the right bank of the cañon not far from the landing, but I was assured that it grows all over the island. Young shoots appeared about the middle of January. (47.)

Opuntia prolifera Engelm. Observed but not collected.

Galium ———. Two species; plentiful in many places, but chiefly under the palms. Not collected.

Filago Californica Nutt. Very plentiful. (25.)

Diplostephium canum Gray. Only one plant seen, in such an inaccessible position on the cliff of the lower circus near the corral, that it was impossible to secure more than a few scanty specimens. (41.)

Eriophyllum ———. Woody, perennial, on a rock near the cabins. (61.)

Perityle Californica Benth. Quite plentiful near the landing along the beach in the bed and on the banks of the cañon; in flower beginning of January. Not seen anywhere else. (46.)

Perityle incana Gray. By far the most abundant of all the shrubs still living on the island and the most likely to survive under the unfavorable circumstances, as it seems quite at home on the more precipitous cliffs, and young plants and seedlings are abundant in the crevices of the rocks. A few straggling flowers appeared as early as the middle of December. (7.)

Matricaria discoidea DC. Plentiful near the springs, on wet ground, which it covers with a dense and tufted carpet; larger specimens were collected at the spring west of the cabins, where they were already blooming at Christmas. (30.)

Artemisia Californica Less. Basaltic cliff east of the cabins in considerable number, also a mile or so to the north. (11.)

Senecio Palmeri Gray. Very conspicuous and much whiter even than *Perityle incana;* perhaps three dozen specimens seen on the eastern cliff above mentioned. (10.)

Microseris linearifolia ? Gray. (56.)

Sonchus oleraceus L. Very common in the bed and on the banks of the cañon near the landing.

Dodecatheon Meadia L. Robust, large-leaved specimens. Most abundant only between the trail to the cabins and the cliff; the finest on the very ridge. Goat-hunters, short of tobacco and attracted by the leaves, have used them as a substitute. They are said to have a most pleasant flavor. (31.)

Gilia Nevinii Gray. Cañon near the landing and very common among rocks over the whole island. Not liked by the goats. (57, 59.)

Nemophila racemosa Nutt. Already in flower early in December on the northwestern part, under the palms. It grows plentifully among rocks all over the island. The goats appear not to like it. (32.)

Ellisia chrysanthemifolia Nutt. (56 bis.)

Phacelia phyllomanica Gray. A most elegant shrub with finely cut foliage, dark green above and whitish below; a con-

siderable number of plants in a limited locality on the cliff east of the corral. (43.)

Emmenanthe penduliflora Benth. Cañon near the landing. (58.)

Krynitzkia maritima Greene. Seen only near the mouth of the cañon, near the landing; beginning to flower in January. (33.)

Krynitzkia foliolosa Greene. Cañon near the landing. (55.)

Convolvulus macrostegius Greene. Highly relished by goats, but still keeping its hold on the most perpendicular cliffs where its drooping deep green masses form a striking contrast to the silvery foliage of *Perityle Palmeri*. No seed could be found and I was only able to obtain a few seedlings. (8.)

Solanum Xanti var. *Wallacei* Gray. On the eastern cliff a little south of the corral. A fine shrub worthy of cultivation, already in flower at the beginning of January, the rather large deep blue—not at all pale—flowers showing well on the deep green foliage. (15.)

Solanum nigrum Dunal. Not so rare as when Prof. Greene visited the island. A few found in crevices of the lower circus, more in the cañon near the landing; perennial but very herbaceous; flowers from white to lilac, quite minute and well distinct from the next. (16, 18.)

Solanum Douglasii Dunal. Perennial, with conspicuous star-shaped, pure white flowers, forming handsome bushes. Three plants found—two on the dike of lava on the southern side of the landing, and one a little way up the cañon. On account of its seeding freely even in winter it is quite likely that many more plants grow on the adjoining almost inaccessible slope overhanging the sea. (17.)

Mirabilis lævis Benth. Only near the landing but there quite plentiful, not only along the beach but also on the precipitous slope overhanging the sea, at the south of it, forming mats of pink flowers already at the beginning of January. (45.)

Chenopodium murale L. Rather common only near the landing. (63.)

Hesperocnide tenella Torr. Very common everywhere. (60.)

Quercus tomentella Engelm. In the northwestern part of the island with the palms. The trees are fine specimens forty to sixty feet high, remarkable for the grayish color of the bark and the size of the leaves, which are glossy dark green on the upper surface and covered with a somewhat rusty tomentum beneath. (4, 5.)

At the eastern part, right under the cliff of the inner circus grow some trees in two different localities more than a mile apart, which if not specifically distinct appear at least to be a very different form, not only by the leaves, but also by the bark which is darker and corky. These trees are rather stunted and branching from the base. No acorns or cupulæ were to be found. A few scattered oaks were also observed near the north end, and it is the only tree to be seen at the southern part. They appear not to grow above 1800 or 2000 feet elevation.

Erythea edulis Wats. Northwestern part of the island, the principal grove not less than one mile and a half long by half to one mile in breadth. There, and in the few other parts where palms are still growing in small numbers their range in altitude appears to be between three hundred and a thousand feet. A few expanded flowers were to be found already at the beginning of December, but the general blossoming takes place in January and the fruits are said to ripen in April. (1.)

Muhlenbergia debilis Trin. Only near the landing, on the beach as well as the banks and bed of the cañon. (34.)

Polypogon monspeliensis Desf. Plentiful only on saline soil around the springs near the corral; goats and donkeys appear to dislike it. (35.)

Cupressus Guadalupensis Wats. Centre of the island and around the springs; very variable in habit, in color, as also in the size and shape of the cones. The principal grove on the higher central plateau covers an area of not less than two or three square miles. (3.)

Pinus insignis var. *binata* Engelm. Only on the northern and northwestern part of the island, the finest trees growing amongst the palms. On some of the trees both the abnormal

two leaves and the normal three were to be seen on the same branch. (2).

Polypodium Californicum Kaulf. Rather scarce, always in shady or sheltered localities. (36.)

Gymnogramme triangularis Kaulf. The most widely spread fern, growing luxuriantly in the crevices of rocks with northern exposure, also in very dry sunny spots, but then much reduced in size. (38.)

Notholæna Newberryi Eaton. Nearly as common as the preceding and always in places fully exposed to the sun. A form is occasionally found associated with the first, but of a more slender habit and much more finely dissected leaves. (39.)

Pellæa ornithopus Hook. The more scarce fern on the island, seen only at the eastern side on basaltic rocks fully exposed to the sun. (37.)

Parmelia physodes L. var. *enteromorpha* Tuck. Exclusively on dead branches of cypresses. (48.)

Usnea barbata L. Growing on the living trunks of the palms, only on side facing the sea. (49.)

Ramalina homalea Ach. On rocks facing the sea among the palm grove, on the western side. (50.)

Physcia sp.? Shady places in various parts of the island. (52.)

For the identification of the above mentioned species I am indebted to Mrs. Katharine Brandegee; for the lichens to Prof. E. L. Greene.

NOTE ON TERMOPSIS ANGUSTICOLLIS HAGEN.

BY C. H. TYLER TOWNSEND.

On February 11th, some large termites were brought to me, which had been found in galleries in dead or nearly dead cottonwood trees (*Populus Fremontii*), near Las Cruces, New Mexico. They consisted of soldiers, workers, and immature sexual individuals showing short wings.

Some specimens were sent to Dr. C. V. Riley, who wrote as follows: "The termite which you send seems to be identical

with the species which was determined for me some time ago by Dr. Hagen as *Termopsis angusticollis.* The specimens which I had received previously had come from California only, although I had received them from San Bernardino, Los Angeles, and Placer Counties."

The following are the measurements of the specimens, including another lot received about a week later:

Soldier: From tips of mandibles to extremity of abdomen is 20 mm.; mandibles are 5 mm. long; body, from base of jaws, 16 mm.; body, excluding head, 11½ mm.; head is a little more than 5 mm. wide.

Worker: 13 mm. long; head, 3½ to 3⅔ mm. wide.

Immature sexual individual: 13 mm. long; head, 3 mm. wide.

The workers and sexual individuals are pale straw color; the soldiers are same color, except that the head is more fulvous, becoming darker anteriorly, and the jaws are black. Smaller individuals than the above were also found. There were no fully winged individuals at this season.

This species is probably *Termopsis angusticollis*, which, with *Termopsis occidentis*, are the largest species of the family mentioned in Dr. Hagen's synopsis of the Neuroptera of No. Amer. (p. 3). The soldier described by Hagen under name *Termopsis occidentis* is not this species, as suggested by Hagen (l. c.). The soldier of the present species does not have the prothorax anteriorly emarginate, but nearly straight instead, and the meso- and meta-thoracic posterior angles are not specially produced.

Termopsis occidentis Wlk. (soldier, body 14 mm.) is described from the west coast of Central America. Dr. Hagen saw the type. *Termopsis angusticollis* Hagen (sexual individual, body 11 mm.) is described from Louisiana, California, and Puget Sound.

These termites are said to make longitudinal galleries in the cottonwood trunks, more or less parallel, running irregularly up and down, a couple of inches or so apart, and being about that much in diameter. A section of a stick containing galleries was brought me, from which I have taken the following measurements:

The stick contains some irregular galleries measuring from 2¾ to 3½ cm., approximately, in diameter, in some places more or less honeycombed, while they widen out in others into a sort of a chamber more or less irregular in shape, the one chamber in the stick being in the region of a knot which has been hollowed out. Small side galleries occur, one measuring 13 by 6 mm.; another, smaller, is 10 by 5 mm.; while a third is 8 by 20 mm. These galleries mostly run with the grain. The side of the largest gallery is 7 cm. in width, the other side being detached. Opposite the chamber this gallery widens to 7½ cm. The portion of the chamber contained in the stick is 7½ cm. one way, by from 1½ to 3 cm. the other. Another gallery is 6 by 2½ cm.; another, 6 by 1½ cm. The galleries are more or less lined with the frass from the termites. Then there are pockets: One, 2½ by 1½ cm. in diameter, and 5 cm. deep; another, 2½ by 1¼ cm., and 3½ cm. deep. Other pockets are smaller.

It is asserted by the foreman on the place from which these termites came, that they are frequently found in the live wood. A row of large cottonwoods along an acequia showed an unhealthy condition, and was cut down. Most of these were found to be mined by the termites. They seemed to prefer the more moist parts of the trees, either live wood or wood moistened by the proximity of the water in the acequia.

NATIVE HABITS OF SEQUOIA GIGANTEA.

BY GUSTAV EISEN.

One of the most beautiful of all trees, as well as one of the very largest, is our well-known *Sequoia gigantea*, or the California Big Tree. No tree known is so well adapted to be a "memorial" tree as this giant of the California Sierra Nevada, not alone on account of its size, which reaches 350 feet in height by 45 feet in diameter, nor by its beautiful and symmetrical form, in which it is not surpassed by any other coniferous tree, not even the famous cedars of Lebanon, Himalaya, and Atlas. But the chief advantage of the Sequoia for memorial planting is

its rapid growth coupled with its longevity. The largest trees in the Sierra must have reached an age of between 4000 to 5000 years. When the Cheops pyramid in Egypt was being constructed our largest Sequoias now standing were already youngsters of respectable size, and when Cæsar conquered Gaul the very trees we now gaze on were already older than almost any other tree now extant.

If we add to its other good qualities those of its ability to stand a very low temperature as well as a very high one, it may be seen that its advantages are indeed many, and that a better tree for memorial planting can hardly be had. But the nature of the *Sequoia gigantea* is little understood, and to this want of knowledge of its nature and the conditions under which it thrives must be laid the many reported failures in growing this tree, failures which are both frequent, alarming, and discouraging. Not one gardener in a million has ever seen the *Sequoia gigantea* in its native home in the Sierra Nevada, and few of those who have seen it have realized the peculiar conditions under which the tree thrives. That our Sequoia is a declining species can now be little doubted, notwithstanding the efforts and statements of several enthusiasts to the contrary. The Sequoia is a relic of the past, at least as far as California is concerned—a relic of a time when the climate was different from now, when it was moister and cooler than the one we now enjoy.

As is well known the *Sequoia gigantea* is found only in groves in the Sierra at altitudes varying from 4000 to 7000 feet, roughly speaking. The northern grove is the lowest, the southern grove the highest in elevation. This shows that a certain altitude is required, or rather that certain conditions attending altitudes are needed, for the welfare of the tree. These conditions of altitude can be only two—heat and moisture.

The further north the lower must be the altitude in order to supply the necessary heat; the further south again the higher must be the altitude in order to give the necessary moisture. That the tree in order to propagate itself successfully is greatly dependent on these two factors, may be inferred by a study of the various localities where it is found. It is not necessary to enumerate these here—they have been already commented upon in

a former paper in this periodical, and are now well known. But from the inspection of the various localities we can draw some conclusions of general interest. All the groves are protected from the north winds more or less, and all face the south and west. All groves grow where moisture is abundant, always around springs, creeks, ponds or meadows, or at least in places where moisture never fails. If we inspect a single grove we always find the largest, handsomest and healthiest tree near the water, at the edge of a meadow or stream. The further away from the water the drier the soil, the smaller and poorer are the trees. This is an invariable fact in every grove. In many instances the largest and finest trees circle around a beautiful meadow, crowding each other, where space is available, or towering singly where there is only ground enough for one. This is, for instance, the case with the "Meadow Maid," in the Bear Creek grove, one of the handsomest and most symmetrical of all the Sequoias. This tree grows on a low knoll, in the midst of a meadow which is always boggy and water-soaked.

Sequoia trunks and cones have been dug up out of many wells on the plains of the Sacramento and San Joaquin Valleys, indisputable proof that the tree in former ages extended to the plains. With the advent of a drier and warmer climate the trees retreated to the hills, higher in the south, lower in the north. At last they became isolated groves, finally, in some localities, isolated trees. Only in the southern groves do we find an abundance of young trees; in some of the northern groves we search in vain for any seedlings. What conclusion can we draw from this? That the *Sequoia gigantea* delights in rich and wet soil, in sheltered positions, and that it occurs in groves. The folly of planting this tree in dry, exposed places, singly or in rows, as is now done everywhere in this State, as well as in other parts of the United States and in Europe, is therefore evident. The greater the failure, the dryer the soil where the tree is planted. Lately I passed an avenue of Sequoias which were all dying out. The cause lay near at hand—dry soil, no artificial irrigation, no rain for six months, hard adobe soil, full exposure to winds, the trees planted in rows or singly. If these trees had been set in groups of a hundred on rich, moist land, where irrigation can be

resorted to in the summer, they would have protected themselves and they would have thrived. They would have been real memorial trees, which might yet be telling of themselves and of those who planted them, in the year 5893.

FIELD NOTES AT SAN EMIDIO.

BY ALICE EASTWOOD.

The ranch lies at the foot of the chain of hills which connects the Sierra Nevada Mountains and the Coast Range. It is watered by the San Emidio Creek, which diffuses itself over the surrounding country and, perhaps, in the spring, may be said to empty into Buena Vista Lake. It is further south than any other inhabited house in the San Joaquin Valley, and the winters are much milder than in adjacent parts of Kern County.

The flora of the lower hills and plains is the same as that which characterizes the San Joaquin Valley. This season was unusually late and unfavorable, for the cold rains retarded vegetation. In the hills especially was the delay apparent. It was the end of March; but the twigs were only budding and the snow covered the side of San Emidio Mountain under the timber almost to its base.

Up on the low hills behind the ranch, the meadowlike summits were covered with flowers. The haze in the atmosphere threw a shadow of unreality over the distant Sierras, where the clouds hung low and the summits were white with the deep snow. Buena Vista Lake seemed so near. Not a tree hid its waters and only the shadows of low, barren hills rested on its bosom. It, too, seemed unreal—a phantom lake or a mirage in the enshrowding haze. The columns of dust that arose and slowly followed each other over the alkali desert were fit inhabitants of the weird scene.

These treeless uplands recalled the Alpine parks of the Rocky Mountains. Perhaps the green was not so deep, the flowers less abundant, and the species fewer in the same area. Certainly the coloring was not so rich and varied. The little streams that trickle from the snow-banks and gather volume as

they flow along were lacking; but the beauty was there, and the difference would be noticed only afterwards when the mind recalled former scenes. Then nothing could be more lovely.

The eye soon learns to distinguish the flowers, even at some distance, by means of the patches of color. "Alfilaria" is omnipresent, and where it monopolizes the soil a faint crimson tint prevails. Wherever the hills or plains are yellow over a considerable area, Baeria has crowded out all competitors. The bright yellow patches on steep hillsides, where there is little or no green, tell of Leptosyne. Glowing orange means Eschscholtzia; creamy white indicates "Creamcups" or Platystemon. Nemophila seems to have drawn bits of the sky to the earth here and there. Othocarpus adds vivid spots of deep crimson, and a peculiar white as of light chinchilla shows where *Gilia tricolor* carpets the ground. These are the most noticeable throughout the day; but at night almost all fold up their petals and go to sleep, and then when it looks as if the snow had suddenly fallen, *Gilia dichotoma* has awakened to keep the stars company.

Nemophila insignis, which everyone calls "Baby-Blue-Eyes," looks as innocent as its name. No one would guess what a struggle is going on within it. The pistils and stamens are at war and threaten to set up separate establishments. Here is one flower in which the pistil cowers down under the domineering stamens which rain down the pollen so that there can be no escape; but here is another blossom where the pistil proudly looks down upon the insignificant and completely subdued stamens. The buds show that the strife begins when the flower is born, and then it is that the supremacy of the male or female is decided.

Meconopsis heterophylla is the most conspicuous inhabitant of the flowery meadow, because of its brilliant color and comparative rarity. Sometimes a group of twenty or more will be seen, but more often they are fewer together or even solitary. The leaves are low down on the stem and therefore concealed by the other vegetation; the blossom is on a long, slender stalk and seems to be detached from the earth, and the bright red corolla deepening at the centre looks like a wavering flame hovering over the grass. It is fertilized in the bud.

Eschscholtzia Californica so glows with the sunbeams caught in its chalice that it diffuses light upon the other flowers and the grass. It will not shine unless the sun beams upon it but folds itself up and goes to sleep. It is fertilized in the bud.

Platystemon Californicus offers some unknown attraction to the bees. They ignore every other flower in their attentions to this creamy beauty. It, too, is fertilized in the bud. The petals and stamens persist until the pods are quite large.

Gilia tricolor, that most attractive little plant whose flowers the children call "Birds'-Eyes," has such a bright, cheerful look, such dainty coloring, so sweet a perfume, that none of the other blossoms can equal it in charm. When the light breezes pass over them they dance along the grass, look up so brightly and nod and smile. The flower is not fertilized in the bud but may be self-fertilized afterwards. The stigmas surpass the anthers, and when the blue pollen is being discharged the style branches are short and do not spread much. Later, they grow very long and curve around so as to meet the anthers.

At about four o'clock in the afternoon *Gilia dichotoma* begins to whiten the hillsides. Before expansion the flowers are hardly noticeable; the dull pink of the edges which are not covered in the convolute corolla hides their identity and makes the change, which takes place when they unveil their radiant faces to the setting sun, the more startling. They intend to watch all night and by sunset all are awake. In the morning they roll up their petals again when daylight comes on, and when the sun is well up all are asleep, tired out with the vigil of the night. The odor is most sickening. I watched them in the afternoon, at night, and in the early morning, and saw no insect approach. The stamens and pistil are deep down in the long tube of the corolla and it must generally be self-fertilized. The same flower opens several times and grows larger as it grows older.

Now, in the early morning, when *Gilia dichotoma* is about to retire, it is time for *Œnothera bistorta* to awaken and act as sentinel through the day. It is not fertilized in the bud, but self-fertilization is possible, though the style is longer than the stamens. As the style is deflexed towards the lower part of the flower which faces the sun and is not erect until mid-day, it can

easily be seen how the pollen of one flower can fall upon its stigma. It goes to sleep earlier than the other flowers and is more regular in its habits. They sleep during the cold and wet; but it always unfolds somewhat at the proper time, though not entirely unless the sun shines brightly.

Astragalus lentiginosus is the favorite flower of the bumble bees. Some plants were collected with pistillate flowers, the stamens being small, separate, and with what seemed abortive anthers. It certainly was a singular freak for an Astragalus, but the peculiarity was common on the late shoots of plants already heavy with fruit. Later it was seen that the change was due to a fungus.

Of course there were many other flowers but they were neither particularly admired nor closely observed. A list would necessarily omit so many prevailing later that it would be unfair to the locality and is better omitted.

A NEW COLLINSIA.

BY S. B. PARISH.

Collinsia Davidsonii. Span high, cymosely few-branched, glabrous: leaves inch long, entire obtuse, ovate or oblong, the lower pedicellate, the floral linear-spatulate: verticils few (3-8) flowered: pedicels shorter than the calyx, this three lines high, scarious at base, the thickened obtuse lobes green: corolla moderately oblique, its upper lobe pale blue, or nearly white, transversely callous, the ample lobes few-toothed; lower lip equaling the upper, its lateral lobes violet, the keel white with dark tip: filaments beardless: gland stipitate, line high: capsule oval, not surpassing the calyx lobes; ovules four in each cell, seeds rugose.

Collected by Dr. Anstruther Davidson on the Mojave Desert; at Lancaster, May, 1893. Types in the Gray Herbarium and in my own. A handsome little plant which I have much pleasure in dedicating to its discoverer.

NEW LOCALITIES FOR CALIFORNIA PLANTS.

BY T. S. BRANDEGEE.

In a region of such great extent as the State of California, so much of it yet wild and unvisited by botanists, we may hardly yet hope to have anything approaching a complete enumeration of the plants to be found within its borders. The distribution of the greater number of the species is, however, already approximately known, though fresh facts as they appear show us continually that the range of very many of them is much greater than has been supposed. The present paper is intended as a record of not only new forms, but of a very considerable number of extensions in range, some of them so unexpected and so far from previous stations as to be hardly credible without the evidence of the collector's specimens.

The data hereinafter given are largely drawn from collections made by Mr. William Vortriede in the Santa Lucia Mountains, in 1892, by Mr. L. Jared at Goodwin and Carisa Plain in the southeastern part of San Luis Obispo County from April to June of the present year, and by Miss Alice Eastwood, also in this year, in the mountains west and south of Bakersfield and west and north of Alcalde, and from the Mission of San Antonio through the coast mountains north to the Sur River. The names of other collectors are given after the stations of the plants collected by them. Where no name appears the collection has been in most cases made by the writer.

Myosurus minimus L. grows in very stout luxuriant form, the long receptacle often branching, about the marsh between Mt. Eden and Alvarado. It is nearly as abundant, but much more slender along the railway between Suisun and Vanden.

Delphinium nudicaule T. & G. Santa Lucia Mountains, *Eastwood*, *Vortriede*.

Isopyrum occidentale H. & A. Santa Lucia Mountains, *Vortriede*; Coburn Mills, Tulare County.

In the alpine region about Mt. Whitney there grows a yellow flowered Aquilegia, probably the one mentioned in the Botany of California as *A. cærulea*. It is common about Mt. Kaweah and there its yellow color often shades into red upon the spurs.

The lower the altitude at which it grows, the more the red appears. *Aquilegia truncata* with yellow centre and red spurs is abundant at lower elevations, and the higher the altitude the more yellow and the less red seems to be the rule, so that when following up a mountain brook a point was reached where it was difficult to distinguish the two species. This same alpine yellow columbine has been collected on other peaks near Mt. Whitney by Mr. Pixotto with the color on the spurs distinctly shading into blue. The scarlet flowered Eastern *A. Canadensis* has a yellow centre and is said in Gray's Manual to be rarely yellow all over, and a plant was found in Connecticut last year with entirely yellow flowers. A yellow-flowered Aquilegia grows near Manitou, Colorado, and specimens sent to Dr. Watson were named *A. cærulea*. These yellow-flowered specimens are noticed by Messrs. Meehan and Jones in Bot. Gazette iv, 248, and vi, 247, and the conclusion reached seemed to be that *A. cærulea* may have yellow flowers. These observations render the value of color uncertain in Aquilegia.

Actæa spicata var. *arguta* Torr. Coast south of the Sur, *Eastwood*.

Pæonia Brownii Dougl. Along the coast from Lower California to the Santa Lucia Mountains; Bartlett Mountain, Lake County.

Vancouveria hexandra Dec. Sur River, *Eastwood*.

Streptanthus cordatus Nutt. Along the trail to Dana's, Santa Lucia Mountains, *Eastwood*.

Stanleya pinnatifida Nutt. Santa Maria Mountains west of Bakersfield, *Watts;* Goodwin, *Jared*.

Isomeris arborea Nutt. Mountains west of Bakersfield, *Eastwood;* Goodwin, *Jared*.

Oligomeris subulata Boiss. Mountains west of Bakersfield, Priest Valley, *Eastwood*.

Viola sarmentosa Dougl. Santa Lucia Mountains, *Vortriede;* Sur River, *Eastwood*.

Viola Sheltoni Torr. Grizzly Peak, Trinity County, *J. W. Blankinship*; Snow Mountain, Lake County.

Silene verecunda Wats. San Carlos, *Eastwood.*

Silene Palmeri Wats. Near Mansfield, Santa Lucia Mountains, *Eastwood.*

Arenaria congesta Nutt. Mineral King, 1892.

Polycarpon depressum Nutt. Mountains near Santa Barbara, May, 1888. Also on Santa Cruz and Santa Catalina Islands.

Lewisia rediviva Pursh. Cantua Mountain, and Jolon, *Eastwood;* Ukiah, *Mrs. M. E. P. McCowen;* Hough's Springs, Lake County; Mountains of Fresno.

Claytonia diffusa Nutt. Mill Valley Cañon.

Claytonia parvifolia Moç. Mill Valley near the waterfall; Lagunitas Creek; Kneeland, Humboldt County, *J. W. Blankinship.*

Sidalcea malachroides (H. & A.) Bixby Creek, Monterey County, *W. E. Bryant,* 1889; Slate's, Santa Lucia Mountains, *Eastwood;* Eureka, Humboldt County, *J. W. Blankinship*, June, 1893.

Claytonia saxosa. Annual acaulescent: leaves broadly spatulate, all radical: scapes numerous, stout 8-10 mm. long, bearing at summit two broad, foliaceous bracts and an umbel of 2-6 flowers on pedicels usually much exceeding the scape: sepals oblong-orbicular 3-4 mm. long, spatulate-obovate, pale rose color nearly twice the length of the sepals: capsule exceeding the sepals 3-ovuled, 1-3 seeded; seeds large, foveolate in lines; colyledons obliquely incumbent.

The plant though from an annual slenderly fusiform root bears considerable resemblance to *C. Megarrhiza.* It grows in dense succulent "balls" 1-3 inches in diameter on the shaly slopes of Snow Mountain, Lake County. Collected June 1891 and on Yolo Bolo in September 1892.

Linum digynum Gray. Sissons, *Dr. Palmer.*

Linum spergulinum Gray. Warthen and Lewis Creek, *Eastwood.*

Erodium Texanum Gray. Frequent and variable in the hills west of Bakersfield, *Eastwood;* and common about Alcalde.

Oxalis Oregana Nutt. Santa Lucia Mountains, *Vortriede;* Sur River, *Eastwood.*

Flœrkea proserpinacoides Willd. Lassen's Peak, June, 1883, *Mrs R. M. Austin;* head of Squaw Valley, July, 1886, *C. F. Sonne;* Susanville, July, 1892.

Staphylea Bolanderi Gray. Near Sequoia Mills, July, 1892.

Lupinus cervinus Kell. Santa Lucia Mountains, the locality where the type was collected by Lobb, *Eastwood.*

Lupinus truncatus Nutt. Slate's Hot Springs, Santa Lucia Mountains, *Eastwood.*

Lupinus hirsutissimus Benth. Sur River, *Eastwood.*

Lupinus gracilis Agardh. Santa Lucia Mountains, *Vortriede.* The solitary specimen is a foot in height, the lower, remote axils bear solitary pedunculate pods, and above, after a leafy interval of six inches, the usual subverticillate raceme.

Hosackia crassifolia Benth. Santa Lucia Mountains, *Eastwood.*

Hosackia sericea Benth. Jolon, *Eastwood.*

Hosackia cytisoides Benth. Santa Lucia Mountains, *Eastwood;* also at Hearst's Ranch, San Simeon.

Hosackia grandiflora var. *anthylloides* Gray. Santa Lucia Mountains, *Eastwood;* Goodwin, *Jared;* also on Tamalpais.

Hosackia argophylla Gray. Santa Lucia Mountains, Sur River, *Eastwood.*

Trifolium longipes var. *latifolium* Hook. Upper Mad River, Trinity County, *J. W. Blankinship.*

Astragalus Purshii Dougl. Cantua Mountains, *Eastwood.*

Astragalus Spaldingii Gray. Honey Lake, July, 1892.

Psoralea Californica Wats. Mt. Hepsidam, *Eastwood;* Bartlett Mountain, Lake County and near Leesville, Colusa County, 1884.

Prunus emarginata Walp. Santa Lucia Mountains, *Eastwood.*

Prunus Andersoni Gray, which is so abundant about Reno,

Nevada, grows scattered through the Sage Brush nearly to Susanville, California.

Agrimonia Eupatoria L. Not uncommon in Napa and Lake Counties.

Carpenteria Californica Torr. The most accessible station now known for this plant is reached by way of the road running northwest from Fresno across Big Dry Creek to the saw mills on Pine Ridge. It covers a hill about a mile above Toll House in the immediate vicinity of the "Grapevine Spring," at which the teams to the mills stop for water. From this locality, discovered by Dr. Gustav Eisen, the seed of most of the plants in cultivation in Europe was obtained. Mr. W. A. Sanders, of Sanders, collected it later near the same place.

Jamesia Americana T. & G. is not mentioned in the Botany of California but is noted in the Botany of King's Report as occurring as far westward as the Wasatch Mountains at an elevation of 7000 feet. It has been found in the Huachuca Mountains of Arizona, a locality distant from the Rocky Mountains of Colorado and New Mexico, where it is very common. Dr. Kellogg, according to the labels attached to the specimens, collected it in Mendocino County. Last summer the writer found it growing among the rocks in the alpine regions of Mt. Kaweah. The bushes were very small, hardly becoming a foot high, dwarfed probably by the climate of the high altitude of the habitat, and instead of the usual white color the flowers were bright pink.

Whipplea modesta Torr. Santa Lucia Mountains, *Vortriede.*

Ribes Lobbii Gray. Shady cañons, Pacific Valley and Sur River, *Eastwood.* Fruit very large. As Lobb is known to have collected in the Santa Lucia Mountains, this is probably the locality of the type.

Eulobus Californicus Nutt. Huron and Alcalde, *Eastwood.*

Eucharidium Breweri Gray. Loma Prieta, and Mt. Hamilton, *W. W. Price,* June, 1890; Priest Valley, *Eastwood.*

Circæa Pacifica Asch. & Mag. Bridgeville, Humboldt County, *J. W. Blankinship.*

Mollugo verticillata L. Newcastle, Placer County, May, 1883.

Sesuvium Portulacastrum L. Buena Vista Lake, *Eastwood;* Tulare Lake, Pyramid Lake, Nev. and frequent about the San Joaquin River near Lathrop.

Cypselea humifusa Turp. Collected by Dr. Parry at Aptos, Santa Cruz County, July, 1883. Very abundant about late dried clay depressions near the San Joaquin Bridge.

Glinus Cambessidesii Fenzl., Ann. Wien Mus. i, 358. The plant so identified at Harvard was collected by C. C. Parry at Chico in 1882, and was found two years later near Folsom. Plants answering better to the description of *Glinus lotoides* L. Sp., 463, were collected at the San Joaquin Bridge near Lathrop, October, 1891, and at Lakeport in August, 1892. The stamens in all the forms are commonly five and the seeds minutely tuberculate in lines. Their nomenclature both under Glinus and Mollugo seems much confused.

Crantzia lineata Nutt. River banks Antioch; Roberts Island; pools near the railway between Port Costa and Martinez, June, 1891 and 1892.

Garrya Veatchii Kell. San Emidio Cañon and New Idria, *Eastwood.* The species is apparently much too near *G. Fremonii.*

Garrya elliptica Dougl. Santa Lucia Mountains, *Eastwood.*

Galium augustifolium Nutt. Alcalde and New Idria, *Eastwood;* Santa Lucia, *Vortriede.*

Pentachæta Lyoni Gray. Goodwin, *Jared.* An anomalous form with the glabrous involucre of *P. aurea*, but the akenes more hirsute than in typical *P. Lyoni*, the bristles of the pappus often more than twenty.

Bigelovia arborescens Gray. Santa Lucia Mountains, *Vortriede.*

Aster radulinus Gray. Santa Lucia Mountains, *Vortriede.*

Hymenoclea salsola T. & G. Goodwin, *Jared.*

Encelia Californica Nutt. Goodwin, *Jared.*

Helianthus invenustus Greene. Sequoia Mills, July, 1892. Stems numerous, eighteen to twenty-four inches in height, from a strong perennial root. A Balsamorhiza in habit, and no pappus found in any of the numerous plants examined.

Madia Nuttallii Gray. Santa Lucia Mountains, *Vortriede;* Sur River, *Eastwood.*

Madia radiata Kell. Alcalde, *Eastwood.* Abundant.

Lagophylla filipes H. & A. Rather widely spread through central and northern California. Guadalupe Mountain, Mariposa County, *J. W. Congdon;* San Antonio Creek, back of Mt. Hamilton, *Frank H. Vaslit;* New York Ravine, El Dorado County; Tamalpais beyond the second summit.

Whitneya dealbata Gray. Prattville, Plumas County, July, 1892; Sequoia Mills, Tulare County, in the same month.

Hulsea heterochroma Gray. Road to Dana's, Santa Lucia Mountains, *Eastwood;* Tule River.

Cacaliopsis Nardosmia Gray. Santa Lucia Mountains, *Vortriede;* Little Sur River.

Crocidium multicaule Hook. Goose Lake, *Mrs. Austin;* Mariposa, *J. W. Congdon.*

Arnica latifolia Bong. Mt. Hamilton, June, 1890, *W. W. Price;* Santa Lucia Mountains, *Vortriede.*

Phalacroseris Bolanderi Gray. Sequoia Mills, July, 1892.

Crepis occidentalis Nutt. Cantua Creek, *Eastwood.*

Picris Sprengeriana Lam. Dict. iv. 310. Ukiah, *Mrs. M. E. P. McCowen.* A waif from the Mediterranean Region.

Lactuca Scariola L. is becoming common about Lake and Upper Napa Counties and about the Sacramento River.

Campanula exigua Rattan. Bot. Gaz. xi, 339, (1886). Priest Valley, *Eastwood.*

Parishella Californica Gray. Goodwin, *Jared.*

Howellia limosa Gray. In ponds near Blocksburg, Humboldt County, *J. W. Blankinship,* June, 1893; previously known only from the Willamette River, Oregon.

Pleuricospora fimbriolata Gray. Mill Creek, near Healdsburg, *Miss Effie McIllriach.*

Trientalis Europæa var. *latifolia* (Hook.) Pacific Valley, *Eastwood.*

Cycladenia humilis Benth. Santa Lucia Peak, *Eastwood;*

Cobb Mountain, Lake County, *C. F. Leithold*, June, 1893; Snow Mountain, June, 1891.

Swertia perennis L. was collected at Mineral King, August, 1892, by Miss Faustina Butler.

Gilia Bigelovii Gray. New Idria, *Eastwood;* Tehachapi.

Gilia lutescens Stend. Common in the Santa Lucia Mountains, *Vortriede, Eastwood.*

Gilia Schottii Gray. Alcalde, *Eastwood.*

Hydrophyllum occidentale Gray. Mt. San Carlos, *Eastwood.*

Phacelia humilis T. & G. Hernandez and New Idria, *Eastwood.*

Phacelia circinatiformis Gray. Hite's Cove, Mariposa County, *Congdon;* Mt. Hamilton, *W. W. Price*, 1890.

Phacelia loasæfolia Torr. Common from San Simeon to the Sur River, *Eastwood, Vortriede.*

Phacelia grisea Gray. Santa Lucia Mountains, *Vortriede;* Little Sur River.

Phacelia Parryi Gray. Between King's City and Jolon, *Vortriede, Eastwood.*

Phacelia Fremonti. Huron, *Eastwood;* Alcalde.

Phacelia affinis Gray. San Carlos Mountain, *Eastwood.* A small form.

Lemmonia Californica Gray. Alcalde, *Eastwood;* Kernville, 1891.

Nama Parryi Gray. Goodwin, San Luis Obispo County, *Jared.* Leaves all entire.

Eritrichium Torreyi Gray. Buena Vista Hills, *Eastwood;* Alcalde.

Datura Stramonium L. Both the white and violet colored (*D. Tatula*) are abundant in Lake County, especially about Upper Lake. *D. Tatula* is not uncommon in Marin County; but *D. Stramonium* is the common form of the Sacramento Valley.

Verbascum Blattaria L. has long been abundant in California. It is found in the foothills above Sacramento; along the San

Joaquin, especially about Robert's Island; in Lake County, and even on Redwood Peak, back of Oakland. Specimens are also in the herbarium of the Academy of Sciences from Sisson, collected by Dr. Palmer, and from Big Meadows, collected by J. G. Lemmon, in 1880.

Collinsia Childii Parry. Santa Lucia Mountains, *Vortriede.*

Mimulus Palmeri Gray. Santa Lucia Mountains, *Vortriede;* Ben Lomond.

Mimulus Congdoni Wats. grows under the shade of Ceanothus bushes not far from the Lagunitas water-tank on the North Pacific Coast Railway. It much resembles *M. latifolius* Gray, of the islands off the coast of California and Mexico.

Mimulus Bolanderi Gray. Tehachapi; Santa Lucia Mountains, *Vortriede.*

Pentstemon Palmeri Gray. Lewis Creek and New Idria, *Eastwood.*

Veronica Buxbaumii Ten. Woodland, *J. W. Blankinship.*

Castilleia plagiotoma Gray. Alcalde, *Eastwood;* Goodwin, *Jared.*

Orthocarpus gracilis Benth. Santa Lucia Mountains, *Vortriede.* It seems not to have been collected since the time of Nuttall.

Aphyllon comosum (Hook.) is extraordinarily abundant in the low, overflowed lands between the San Joaquin and Paradise Cut about and beneath the railway trestle. It there blooms in August and September, both the plant and the flower unusually large, and from white through shades of lavender to purple. It seems there to be always parasitic on Grindelia.

Boschniakia strobilacea Gray has been brought from Willett's, Mendocino County, by Dr. Mary G. Campbell; and from Applegate in southern Oregon, by Mrs. H. S. Durden. It appears to grow always upon roots of Manzanita.

Utricularia vulgaris L. Blocksburg, Humboldt County, *J. W. Blankinship;* near San Joaquin Bridge; ponds near Olema.

Acanthomintha lanceolata Curran. Specimens of this plant obtained recently show that it is not nearly so widely separated

from *A. ilicifolia* as had been supposed, and it will not be surprising if fuller collections quite bridge the gap between them. Specimens collected by Jared, near Goodwin, have the upper lip of the pubescent corolla truncate, entire; middle lobe of the lower shortly two-lobed; anthers four, two-celled, not truly confluent, all woolly filaments nearly of equal length. A specimen collected by Lobb, at San Antonio, has the upper lip entire, middle lobe of the lower lip rather long and broadly spatulate; the four anthers woolly, nearly equal. A similar specimen collected by Mr. J. B. Hickman, somewhere in Monterey County, has the middle lobe of the lower lip narrower and the posterior anthers smaller on shorter filaments. Specimens by Miss Eastwood, from Priest Valley, have the upper lip of the glabrous corolla very shortly two-lobed, lobes of the lower lip nearly equal, the middle one linear somewhat pointed; anthers glabrous the posterior on much shorter filaments. Specimens from Warthen and Hernandez have pubescent corolla, both the upper lip and the somewhat obovate middle lobe of the lower lip emarginate; anthers somewhat woolly. Specimens from Mt. Hamilton, 1890, collected by W. W. Price, have the upper lip still more deeply lobed than the type, the lobes emarginate, middle lobe of the lower lip considerably longer than the lateral, emarginate and erose.

Monardella nana Gray. Santa Lucia Mountains, *Vortriede;* Little Sur, 1888.

Monardella Breweri Gray. Santa Lucia Mountains, *Vortriede*, *Eastwood*.

Audibertia humilis Benth. Santa Lucia Mountains, *Vortriede.*

Trichostema lanatum Benth. Santa Lucia Mountains, *Vortriede*, *Eastwood.*

Lamium amplexicaule L. Near Ione, May, 1886, and along the railway between Mt. Eden and Alvarado, June, 1893.

Melissa officinalis Tourn. (Common Balm.) San Rafael Water Works, *John McLean;* waysides, Santa Rosa; both in 1892.

Nepeta Cataria L. (Catnip.) Ager, July, 1887; Scott Valley, Lake County, abundantly in 1892.

Nepeta Glechoma Benth. Rather common about low lands in the Sacramento Valley.

Salvia Æthiopsis L. Established along the roadsides in Susanville, July, 1892.

Leonurus Cardiaca L. Oregon City. "Lobb."

Abronia villosa Wats. Alcalde, *Eastwood.*

Mirabilis lævis Benth. Pacific Valley, *Eastwood;* Alcalde.

Phytolacca decandra L., recently recorded from Los Angeles County, was observed by Frank H. Vaslit on Cow Mountain, in the northern part of Lake County, in 1885. It is very abundant along the California & Oregon Railway in the Siskiyou Mountains. Blue Lakes, Lake County, *J. W. Blankinship.*

Eriogonum inflatum Torr. Goodwin, *Jared.*

Eriogonum trichopodum Torr. Alcalde, *Eastwood.*

Chorizanthe perfoliata T. & G. Alcalde.

CHORIZANTHE VORTRIEDEI. Annual, reddish, prostrate, minutely glandular, but otherwise glabrous: leaves spatulate; bracts three-parted, shortly spinulose, small; nodes of the stem elongated: involucres 5 mm. long, quadrilateral, slightly saccate at base, shortly cleft into four equal lobes tipped with very short, erect spines, which are either straight or slightly hooked at tip: flowers long-pedicellate, two in each involucre; perianth exserted, lower half yellow, upper rose-color; segments deeply bilobed, the lobes lanceolate and somewhat spreading: stamens, nine.

The specimens are too young to admit of a description of the seed. In age they would probably be of considerable size, the spreading branches in some of the specimens having already attained a length of six inches or more. It is nearest *C. Thurberi* (Benth.) Collected in the Santa Lucia Mountains by William Vortriede in June, 1892, and by Miss Eastwood in June, 1893.

Chorizanthe Thurberi Watson. Alcalde, *Eastwood*, involucres, 8 mm. long.

Chorizanthe staticoides Benth. Alcalde, *Eastwood.*

Chorizanthe uniaristata T. & G. Alcalde, *Eastwood.*

Chorizanthe polygonoides T. & G. Antioch; Livermore; Laundry Farm near Oakland; Tamalpais.

Chorizanthe insignis Curran. Jolon, *Eastwood;* Santa Lucia Mountains, *Vortriede;* frequent in the range.

Eurotia lanata Moq. Goodwin, *Jared.*

Euphorbia hirtula Engelm. Nacimiento River, *Eastwood.*

Ephedra Nevadensis Wats. Hills west of Bakersfield, *Eastwood;* Goodwin, *Jared.*

Cephalanthera Oregana Reich. Santa Lucia Mountains, *Vortriede.*

Allium Parryi Wats. Mt. Hepsidam Range, *Eastwood.*

CHLOROGALUM PURPUREUM. Bulb ovoid, 2-3 cm. in diameter, membranously coated: stem $\frac{1}{3}$-$\frac{1}{2}$ m. high paniculately branched: leaves rather narrow, linear, undulate: pedicel as long or longer than the perianth: perianth not vespertine, about 1 cm. in breadth, spreading from above the base; segments oblong-ovate with strong midnerve: stamens as long as the segments, spreading; filaments filiform purple: anthers yellow: style as long as the stamens, curved to the side: ovary sessile, ovules one in each cell.

A very handsome species, the numerous flowers purplish blue. Nearest *C. parviflorum.* Collected in the Santa Lucia Mountains in 1892, by William Vortriede; in 1893 in much better specimens by Miss Eastwood.

Chlorogalum angustifolium Kell. Mormon Island, Sacramento County; Tuolumne County near Big Oak Flat; between Ione and Carbondale; Round Valley, Mendocino County, *J. W. Blankinship.*

Fritillaria pluriflora Torr. Capay Valley, Yolo County, March 23, 1893, *J. W. Blankinship.* Seldom collected, flowers very handsome more than an inch long.

Odontostomum Hartwegi Torr. Near Napa, *A. W. Robinson,* 1892.

Prosartes Hookeri Torr. Santa Lucia Mountains, *Vortriede.*

Clintonia uniflora Kunth. Sequoia Mills.

Clintonia Andrewsiana Torr. Santa Lucia Mountains, *Vortriede, Eastwood.*

Lysichiton Kamtschatcensis Schott. Santa Cruz Mountains near Boulder Creek, *W. G. Farlow.*

Nitella clavata var. *inflata.* In Echo Lake, Santa Catalina Island, May, 1890.

ADDITIONS TO THE FLORA OF SOUTHERN CALIFORNIA.

BY S. B. PARISH.

Since the completion of the Botany of the Geological Survey a considerable number of plants have been detected which were not then known to grow within the limits of the State, and the range of others has been found to be much more extensive than is indicated in that work. Probably these additions and extensions have been more numerous in the southern counties than elsewhere. Owing to the premature discontinuance of the survey the botanical exploration of these counties was less thorough than in the upper part of the State, which then contained a far larger proportion of the total population than at present. With a single notable exception the South was also entirely without local botanists, Mr. Daniel Cleveland having been for years the only resident cultivator of the science. It was not until near the completion of the second volume that a few records are made based on the collections made by Rev. J. C. Nevin and Mr. W. G. Wright, and the explorations of Parry and Lemmon. Since then the knowledge of the southern flora has been greatly enlarged by others who have become residents of the region, among whom may be mentioned Mr. W. S. Lyon, Mr. C. R. Orcutt, Dr. H. E. Hasse, Dr. A. Davidson and Prof. A. J. McClatchie.

This botanical activity has resulted in the discovery of a number of new species, and the extension to this region of others.

Some of these extensions have been noted in the last volume of the Synoptical Flora, or in recent monographs and other papers. A considerable number, however, remain as yet unrecorded, and some of the more interesting of these are given in the following list, which makes no pretense to completeness, and, indeed, might easily be considerably enlarged. The place of publication is cited for these species not enumerated in the Botany of the Survey, and these are additions to the flora of the State, as well as to that of Southern California. The others extend the range of more northern plants not heretofore recorded from the southern counties. With the exception of a few rare species none of those are included whose previously known range was south of the latitude of San Francisco.

Phytographically these northern plants belong to the Sierra Nevadan flora, and they form most of the additions to the vegetation of our higher mountains. The Sonoran flora of the arid regions to the east, Nevada, Arizona, Utah, has supplied the additional desert plants, and some of those which climb the desert flanks of the mountains. The stations for the first class are in many cases the southern limit of the species, and those for the second class the western or northern limit. Some exceptional plants will be noticed by the reader. All stations recorded are authenticated by specimens in the herbarium of the writer, and when no other collector's name is cited his is to be understood.

Myosurus apetalus Gay, Fl. Chil. i, 31. Borders of lake, Bear Valley, in San Bernardino Mountains, altitude 6000 to 7000 feet.

Ranunculus Eschscholtzii Schlecht. Anamad. Ranunc. ii, 16. Summit of Grayback Mountains, altitude 11,725 feet, *W. G. Wright.*

Ranunculus alismæfolius Geyer, var. *alismellus*, Gray. Tauquitz Meadows, San Jacinto Mountains, *Dr. H. E. Hasse.*

Arabis Ludoviciana C. A. Meyer, Ind. Sem. Petr. ix, 60. San Diego, *D. Cleveland.*

Caulanthus procerus Wats. Northern slope of San Bernardino Mountains, at about 6000 feet altitude, Bear Valley road.

Nasturtium sphærocarpum Gray, Pl. Fendl. 6. Mouth of Santa Ana Cañon, San Bernardino Mountains.

Cleomella oöcarpa Gray. Rabbit Springs, Mojave Desert.

Viola blanda Willd. Not uncommon about cold springs in the San Bernardino Mountains, at from 5000 to 7000 feet altitude.

Viola chrysantha Hook. Common in moist sands from Bear Valley to head of Cañon Diablo, San Bernardino Mountains.

Silene Menziesii Hook. Stream banks, Bear Valley.

Stellaria borealis Bigelow. Cold bogs, Bear Valley.

Sagina occidentalis Wats. Streets of Los Angeles, *Hasse;* hillsides, Santa Monica, *Davidson;* Santa Catalina Island, *Lyon.*

Sagina Linnæi Presl. Cold bog, near Bear Valley dam.

Lewisia rediviva Pursh. Bear Valley; San Antonio Peak.

Lewisia brachycalyx Engelm. Meadows, Bear Valley.

Bergia Texana Seub. Inlet of Elsinore Lake, Riverside County.

Horsfordia Newberryi Gray, Proc. Am. Acad. xxii, 297. *Abutilon Newberryi* Wats. Bot. Calif. i, 87. Rocky ravines at Toros, on the Colorado Desert.

Linum micranthum Gray. Newhall, *Davidson.*

Ayenia pusilla L. Cañons at Agua Caliente (Palm Springs), Colorado Desert.

Geranium cæspitosum James, Long's Exp. ii, 3. Bear Valley, *Parish;* Tauquitz Valley, *Hasse.*

Condalia spathulata Gray, Pl. Wr. i, 32. Mountains of the Colorado Desert near Mesquite Station, *W. F. Parish.*

Glossopetalon spinescens Gray, Pl. Wr. ii, 29, t. 12. Northern slope of San Bernardino Mountains, near Cushenberry Springs.

Acer glabrum Torr. Headwaters of Mill Creek, San Bernardino Mountains.

Psoralia castorea Wats. Proc. Am. Acad. xiv, 291. Sand hills at Camp Cady, Mojave Desert.

Astragalus Preusii Gray, Proc. Am. Acad. vi, 222. Sand hills at Dos Palmos, Colorado Desert.

Hoffmanseggia stricta Benth. in Gray, Pl. Wr. i, 56, ii, 50. Gravelly plains at San Felipe, Colorado Desert.

Hoffmanseggia microphylla Torr. Mex. Bound. 50. Dry washes of the Colorado Desert; Toros; Indian Wells; Agua Caliente.

Calliandra eriophylla Benth., Lond. Jour. Bot. iii, 105. Colorado Desert near Mesquite Station, *W. F. Parish.*

Ivesia santolinoides Gray. Holcomb Valley, San Bernardino Mountains, at 7500 feet altitude.

Tellima tenella Walp. Bear Valley, San Bernardino Mountains.

Ribes cereum Dougl. Bear Valley, *Parish;* Tauquitz Valley, *Hasse, Parish.*

Sedum spathulifolium Hook. Big Meadows, San Bernardino Mountains, *Wright.*

Cotyledon Nevadensis Wats. Common on southern slope of San Bernardino Mountains, at from 2000 to 4000 feet altitude.

Lythrum Hyssopifolia L. Sp. Pl. 447. River bed at San Diego, *Cleveland.*

Œnothera Palmeri Wats. Proc. Am. Acad. xii, 251. Mojave Desert, from Antelope Valley to Rabbit Springs, *Davidson, Hasse, Parish.*

Mentzelia congesta T. & G. Mojave Desert, probably near Rock Creek.

Mentzelia Wrightii Gray, Pl. Fendl. 48. Mammoth Tank, Colorado Desert, *W. F. Parish.*

Petalonyx nitidus Watson, Am. Nat. vii, 300. Cushenberry Springs.

Symphoricarpos oreophilus Gray. San Bernardino Mountains, at about 6000 feet altitude; Bear Valley; Mill Creek Falls.

Peucedanum villosum Nutt. Acton, *Hasse.*

Galium Rothrockii Gray, Proc. Am. Acad. xvii, 203. Syn. Fl. I, ii, 39. Colorado Desert, probably at Mountain Springs.

Galium stellatum Kellogg, Proc. Calif. Acad. ii, 77. Crevices of dry cliffs, Agua Caliente.

Brickellia atractyloides Gray, Proc. Am. Acad. viii, 290. Crevices of cliffs; Vallecito; Agua Caliente; Cushenberry Cañon.

Aplopappus lanceolatus T. & G. Fl. ii, 241. Meadows at Bear Valley and Holcomb Valley.

Antenaria alpina Gærtn. Summit of Grayback Mountain, *Wright.*

Hemizonella Durandi Gray. Common in the San Bernardino Mountains, at from 4000 to 5000 feet altitude.

Senecio eurycephalus T. & G. Dry ridges at summit of Tejon Pass. Insufficient specimens from Wilson's Peak, *Davidson*, may belong here.

Microseris Douglasii Gray. Meadows at Elizabeth Lake.

Downingia pulchella Torr. Cuyamaca Mountains.

Bryanthus Breweri Gray. Big Meadows in the San Bernardino Mountains, *Wright.*

Chimaphila Menziesii Spreng. Mill Creek Falls, San Bernardino Mountains.

Pyrola picta Smith. Near the summit of San Antonio Peak.

Pterospora andromedea Nutt. Common in open pine forests in the San Bernardino and San Jacinto Mountains, at from 4000 to 8000 feet altitude.

Forestiera Neo-Mexicana Gray, Proc. Am. Acad. iv, 304. Mojave Desert; Lancaster, *Davidson;* Rock Springs; Rabbit Springs, *Parish.*

Amsonia tomentosa Torr. Fremont's Rept. 2d Ed. 316, Cactus Station, Cushenberry Cañon.

Astephanus Utahensis Engelm. Am. Nat. ix, 349. Gravelly plains, San Felipe.

Gentiana simplex Gray. Little Bear Valley, San Bernardino Mountains.

Gentiana Amarella Linn. var. *acuta* Hook. f. Bear Valley.

Gilia Bigelovii Gray, Proc. Am. Acad. viii, 265. Morongo Pass.

Gilia Breweri Gray. Bear Valley.

Gilia latifolia Wats. Am. Nat. ix, 347. Warm Springs on the Mojave Desert.

Phacelia Lemmoni Gray, Syn. Fl. II, i, 417. *P. heterosperma*, Parish, Bot. Gaz. xiii, 37. Rock Creek, Mojave Desert.

Tricardia Watsoni Torr. Agua Caliente, *Davidson, Parish.* Abundant near Cushenberry Springs.

Nama stenocarpum Gray, Proc. Am. Acad. x, 331. Santa Monica, *Hasse.*

Nama Rothrockii Gray. Holcomb Valley.

Coldenia canescens DC., Prod. ix, 559. Mesquite Cañon, Colorado Desert, *W. F. Parish.*

Harpagonella Palmeri Gray. Mesas near San Diego, *Parry.*

Krynitzkia leucophæa Gray. Abundant near Cushenberry Springs.

Cuscuta obtusifolia HBK. var. *glandulosa* Engelm. Trans. St. Louis Acad. i, 492. On Polygonum, San Bernardino.

Cuscuta denticulata Engelm. Cushenberry Springs.

Pentstemon breviflorus Lindl. Lancaster, *Davidson.*

Pentstemon Eatoni Gray. Cushenberry Cañon.

Pentstemon pumilus Nutt., var. *incanus* Gray, Syn. Fl. II, i, 259. Aguanga, San Jacinto Mountains.

Pentstemon ambiguus Torr. Ann. Lyc. N. Y. ii, 228. San Felipe.

Pentstemon Bridgesii Gray. Mill Creek Falls.

Veronica alpina L. San Jacinto Mountains.

Utricularia vulgaris L. Bear Valley.

Martynia altheæfolia Benth., Bot. Sulph. 38. Valiecito.

Lippia lanceolata Mich. Fl. ii, 15. Los Angeles, *Hasse;* San Bernardino.

Sphacele calycina Benth. var. *Wallacei* Gray. Wilson's Peak, *Davidson.*

Boerhavia viscosa Lag. Andrea's Cañon, near Agua Caliente.

Abronia nana Wats. Proc. Am. Acad. xiv, 294. Bear Valley.

Polygonum emersum Britt., Trans. N. Y. Acad. Sci. viii, 73; Small, l. c. 359. San Diego, *Cleveland.*

Polygonum incarnatum Ell. Sk. i, 456, Small, l. c. 358. Los Angeles, *Davidson.*

Eriogonum Parryi Gray, Proc. Am. Acad. x, 77. Mojave Desert, Warm Springs.

Eriogonum Kennedyi Porter. Bear Valley, near Beardstown.

Eriogonum microthecum Nutt. Bear Valley.

Eriogonum Plumatella Dur. and Hilg. Mojave Desert; Rabbit Springs, etc.

Oxytheca Watsoni T. & G. Near Cushenberry Springs.

Euphorbia eriantha Benth. Agua Caliente, *Davidson*, *Parish.*

Callitriche marginata Torr. Santa Monica, *Hasse.*

Callitriche verna L. Julian; Bear Valley; Little Bear Valley.

Myrica Californica Cham. Santa Monica, *Hasse, Lyon.*

Salix cordata Muhl., var. *Watsoni* Bebb. Bear Valley.

Salix flavescens Nutt. Bear Valley Toll Road, *Parish;* Grayback Mountain, *Wright.*

Arceuthobium divaricatum Engelm. On *Pinus monophylla*, Cushenberry Cañon; Cox's Ranch.

Lilium pardalinum Kellogg. San Bernardino, *Wright.*

Calochortus clavatus Wats. Los Angeles, *Davidson.*

Calochortus flexuosus Wats. Am. Nat. vii, 303. Rev. Lil. 266. Cushenberry and Rabbit Springs.

Potamogeton fluitans Roth. *P. lonchites* Tuckerm. Near Colton.

Potamogeton natans L. Bear Valley.

Potamogeton pectinatus L. Elsinore Lake, *McClatchie, Parish;* Los Angeles, *Nevin;* San Bernardino; Bear Valley.

Sagittaria calycina Engelm., Gray's Man. 5th Ed. 492. Coyote Creek, near Anaheim.

Juncus Leseurii Bolander. Waterman's Cañon, near San Bernardino; Fallbrook.

Juncus obtusatus Engelm. Little Bear Valley.

Juncus Mertensianus Meyer. Head of Mill Creek.

Carex straminea Schk., var. *mixta* Bailey, Proc. Am. Acad. xxii, 151. Waterman's Cañon.

Carex Deweyana Schw., var. *Bolanderi* W. Boott. Mill Creek Falls.

Carex festiva Dewey. Bear Valley.

Andropogon macrourus Mich. Foothills near San Bernardino.

Alopecurus geniculatus L., var. *aristulatus* Munro. Bear Valley.

Stipa occidentalis Thurb. Mill Creek Falls.

Muhlenbergia Texana Thurb. Coult. Man. Rocky Mountain Bot. 410. Vallecito.

Sporobolus gracillimus Scrib. Grayback Mountain, *Wright.*

Agrostis scabra Willd. Bear Valley.

Deschampsia calycina Presl. San Gabriel, *Hasse;* Bear Valley.

Triodia pulchella HBK. Mesquite Cañon, *W. F. Parish.*

Poa Bigelovii V. & S. Agua Caliente, *Davidson.*

Glyceria nervata Trin. Little Bear Valley.

Equisetum lævigatum Al. Br. Common at San Bernardino.

Cryptogramme acrostichoides R. Br. Big Meadows, *Wright.*

Woodsia Oregana Eaton. Grayback Mountain, *Wright;* Lower Holcomb Valley, *W. F. Parish.*

ROMNEYA COULTERI Harv. Mrs. Ida M. Blochman, of Santa Maria, has recently obtained this plant on the Cuyama or Santa Maria River, "growing right on the river looking across into San Luis Obispo County." It has not yet been reported nearly so far north.

SIERRA NEVADA PLANTS IN THE COAST RANGE.

BY KATHARINE BRANDEGEE.

The great valley of California is a basin or plain irregularly elliptical in shape and about five hundred miles in length by one hundred in breadth. It is rimmed all around with mountains, the only opening being that from which all the waters of the basin escape to the sea. The northern half of the valley, drained by the Sacramento and its tributaries, is called the Sacramento Valley; the southern half, drained by the river of that name, is called the Valley of the San Joaquin. The slope of the land is to the centre, where the two rivers meet and pour their mingled waters into the Bay of San Francisco. The rim of the valley is highest where the Sierra Nevada makes its eastern wall, even the Truckee Pass, where the Central Pacific Railroad crosses it, being over seven thousand feet in altitude. The southern wall, formed by the Tehachapi Range, is nearly four thousand feet in its lowest passes; the northern, formed by the Shasta Range is but little less, and the western, though lower, is double, with a long valley or series of valleys intervening, the inner, at least in the northern half, having many peaks of considerable altitude, Yolo Bolo being over eight thousand feet, Sanhedrim, Hull and Snow Mountain between six and seven thousand.

Seeds transported by whatever agency must find suitable conditions or they will not thrive, and to this fact, of course, we owe the diversity of flora still existing. The broad hot valley of California offers no suitable home for the plants of the Sierra and they cannot cross it. The valley plants cannot endure the cold of the mountains, and if they flourish for a season even their seeds succumb to the winter frosts.

It is perhaps from a consideration of the barrier interposed by this valley that the flora of the Sierra Nevada has been considered to be so different from that of the Coast Range that surprise is often expressed at the finding of additional species common to both. It is, however, easily understood that plants may follow the valley wall in any direction and for a distance limited only by comparative height and consequent degree of heat.

The localities of plants should be observed and recorded at

the earliest possible date. Man brings with him so many disturbing elements that a few years may almost change the face of nature. Of these disturbing factors, one of the greatest is a flock of sheep. Not only does it destroy or render very scarce many of the native plants, but in California, where sheep are kept on the public domain, they are fed in the spring months on the foothills, are driven to the high mountains as the season advances, and back as the snow threatens, to the stubble fields and tule marshes of the lowlands. In these peregrinations they distribute in varying proportion the seeds of many of the plants growing in the regions passed over. There is scarcely a spot except upon the highest peaks, where sheep have not penetrated and altered to some extent the character of the flora.

The railway lines are another potent factor in the disturbance of distribution, the construction trains, which transport rock and earth for embankments, offering special facilities for the wandering of species, but their action being more definite and much more recent, is in most cases readily understood and causes no confusion, as for instance in the invasion of the San Joaquin Valley by the plants of the Mojave Desert now in active progress.

The species enumerated below are in most cases additions to the known flora of the Coast Range or have their range much extended southward. It does not comprise all the additions collected, the grasses, Cyperaceæ, etc., being neglected, and even of the other orders a considerable number have escaped reckoning on account of the distribution of the plants in the herbarium, no list having been made, and only those included which could be recalled from memory and readily verified. The greater part of them were obtained from Snow Mountain in Lake County in two visits; one made by Mr. Brandegee in June, 1891; the second by the writer late in August, 1892.

Snow Mountain is in Lake County and nearly due north a little more than a hundred miles from San Francisco. It rises to a height of nearly 7000 feet, and the depth of the winter snow and the degree of cold is apparently quite as great as at the summit of the Donner Pass in the central Sierra Nevada. The plants are still insufficiently known, the top being covered with snow

drifts at the date of the earlier visit, while at the later one the sheep had nearly finished all that were to their taste. No one lives on the upper part of the mountain, but there are remains of old cabins at the summit meadows, where the shepherd pitches his tent for the late summer when the flocks are driven up from the lower slopes. In the clear cold streams which run down its gorges to join the south fork of the Eel River, trout abound and deer are a common sight, and venison is familiar food to the visitor.

The landscape forcibly reminds of the Sierra Nevada. The small lakes and boggy meadows are bordered by Veratrum and alpine asters, and spangled with white violets and the primrose mimulus all hoary with dew-entangled hairs. The upper slopes and dry valleys are covered with forests of white cedar, fir and "Jeffrey's pine," surrounded by thickets of the bitter cherry (*Prunus emarginata*) and the "snowbush" (*Ceanothus cordulatus*), while the peaks and ridges and the dry uplands of the meadows are brightened by the scarlet *Gilia aggregata*, the well-known "pussy's paws" (*Spraguea umbellata*), the brilliant yellow *Eriogonum umbellatum*, the broad tufts of purple and white *E. ovalifolium*, and the fluffy rose-colored balls of the most beautiful of all the species, *E. Lobbii*.

A few additions to the coast flora were made by Mr. Brandegee in a visit of a single day, late in September, to the Yolo Bolo.* The mountain had been at that date so ravaged by sheep, that no food whatever remained for the horses, and the trip was brought to an untimely conclusion.

Mr. C. F. Leithold, a student of the Stanford University, made in June of the present year a collection of the plants of Cobb Mountain, in Lake County, a few miles north of Mt. St. Helena. Its flora is almost the same as that of the neighboring mountain, but *Abies concolor* is found upon it.

The general level of Lake County is of considerable altitude, Clear Lake which occupies its centre being about 1500 feet, so that the elevation of the mountains above the level of the sea is a good deal greater than their apparent height. Bartlett

* Called on the maps "Yallo Ballo," but pronounced as above by the people of the vicinity.

Mountain which rises steeply from the northeastern shore of the lake is about 4000 feet altitude. Mt. Hanna, often called "Bottle Glass Mountain" from the quantity of obsidian found upon it, is some distance away from the lower end of the Lake, on the western side, and its elevation is considerably less. The plants of the Sierra Nevada found on these mountain tops differ somewhat, in most cases, from those of the original locality, a difference easily to be explained by their isolation and difference of the soil. Micromorphic botanists may indeed insist that the differences between these plants found on the massive granite of the Sierras and those on the many-colored shales of Snow Mountain are sufficient to constitute species.

Ranunculus alismæfolius var. *alismellus* Gray. Borders of meadows, Snow Mountain, June.

Argemone hispida Gray. Summits of Snow Mountain, evidently brought there by the sheep.

Arabis platysperma Gray. Snow Mountain.

Vesicaria montana Gray. Snow Mountain.

Viola blanda Willd. Meadows, Snow Mountain.

Viola aurea var. *venosa* Wats. Snow Mountain, June.

Viola Sheltoni Torr. Snow Mountain, June.

Polygala cornuta Kell. Proc. Cal. Acad. i, 61. *P. Californica* of Bot. Cal. Snow Mountain.

Silene Menziesii Hook. Snow Mountain.

Arenaria verna L. var. *hirta* Wats. High rocky ridges, Snow Mountain; Yolo Bolo.

Claytonia Chamissonis Esch. Cold bogs and streamlets, Snow Mountain.

Spraguea umbellata Torr. Snow Mountain.

Sidalcea Oregana Nutt. Snow Mountain. The Sierra Nevada form.

Ceanothus prostratus Benth. On Mt. St. Helena in the form described as *C. divergens* Parry. On Cobb and Snow Mountains quite as prostrate as in the Sierra Nevada.

Ceanothus velutinus Dougl. From Mt. St. Helena, where it

grows abundantly a short distance back of the Toll House, northward, but not seen on Snow Mountain.

Ceanothus cordulatus Kell. A prevailing shrub in the thickets near the top of Snow Mountain.

Lupinus laxiflorus Dougl. Snow Mountain.

Trifolium cyathiferum Lindl. Snow Mountain; also collected by Mr. J. W. Blankinship in Big Valley, Lake County.

Hosackia stipularis Benth. Cobb Mountain. An exceedingly glandular form. Collected by C. F. Leithold.

Psoralea Californica Wats. seems hardly distinct from *P. esculentus.* It is common enough about elevations of 3–5000 feet in Lake County, and has been collected by the writer on Mt. Diablo, by S. B. Parish on the San Bernardino Mountains, by Miss Eastwood on the peaks west of Alcalde, and near Kernville by Mr. Brandegee.

Astragalus Purshii Dougl. Snow Mountain; Yolo Bolo.

Prunus emarginata Walp. Abundant, forming tangled thickets, in the summit valley of Snow Mountain.

Rubus leucodermis Dougl. Snow Mountain. Common.

Purshia tridentata DC. Slopes of Snow Mountain at 5000 to 6000 feet.

Cercocarpus ledifolius Nutt. Covering a spur of Snow Mountain, not far from the Coast Survey monument. The gnarled trunks twelve to eighteen inches in thickness.

Potentilla gracilis Dougl. Snow Mountain. Common in high meadows.

Horkelia tridentata Torr. Snow Mountain.

Ivesia Gordoni T. & G. Near the monument, Snow Mountain.

Saxifraga peltata Torr. Snow Mountain, streams of the lower part.

Ribes Lobbii Gray. Snow Mountain. Equally abundant with *R. Menziesii* Pursh. The fruit is so strongly glandular as to be scarcely fit for any use.

Sedum obtusatum Gray. Snow Mountain.

Gayophytum ramosissimum T. &. G. Snow Mountain. Common.

Gayophytum pumilum Watson. Snow Mountain and common about Lake County.

Megarrhiza muricata Wats. Common in Lake County and in Colusa County not far from Leesville. The fruit usually 8-seeded.

Galium Bolanderi Gray. Snow Mountain; Yolo Bolo.

Galium multiflorum Kell. In crevices of rocks, Snow Mountain; Yolo Bolo.

Eupatorium occidentale Hook. Streams about the base of Snow Mountain.

Brickellia Greenei Gray. Snow Mountain; Yolo Bolo. Flowering in August and September.

Aplopappus apargioides Gray. Snow Mountain.

Aplopappus Greenei Gray. Snow Mountain; Yolo Bolo. August.

Bigelovia graveolens Gray. Shasta Plains; Sissons; Yolo Bolo; Snow Mountain; Bartlett Mountain; Mt. Hanna. Flowering at the end of August.

Aster Shastensis Gray. Snow Mountain; Yolo Bolo.

Aster adscendens Lindl. Snow Mountain.

Antennaria luzuloides var. *argentea* Gray. Snow Mountain; Elk Mountain.

Antennaria Geyeri Gray. Yolo Bolo.

Hemizonella Durandi Gray. Bartlett Mountain; Snow Mountain.

Chaenactis Douglasii H. & A. Snow Mountain.

Arnica foliosa Nutt. Very abundant along streams and covering a long slope near the monument on Snow Mountain.

Raillardella Muirii Gray, var. Abundant on rocky slopes near the monument on Snow Mountain. It was just coming well into bloom on the twenty-fifth of August.

Crepis intermedia Gray. Snow Mountain.

Crepis occidentalis var. *crinita* Gray. Snow Mountain.

Crepis occidentalis var. *Nevadensis* Kell. Cobb Mountain, *C. F. Leithold.*

Arctostaphylos Nevadensis Gray. Snow Mountain.

Pyrola picta Smith. Common on Snow Mountain.

Pyrola rotundifolia L. Cobb Mountain, Lake County, *C. F. Leithold.*

Pyrola aphylla Smith. Often collected on Tamalpais, and frequent through Lake County, northward.

Pterospora andromedea Nutt. Snow Mountain.

Cycladenia humilis Benth. Common and abundant on the higher slopes of Snow Mountain.

Schizonotus purpurascens Gray. This species is widespread and abundant on Snow Mountain, flowering in June and ripening its fruit in September.

Frasera nitida Benth. Cobb Mountain, *C. F. Leithold;* Mt. Hanna; Snow Mountain.

Frasera speciosa Dougl. Yolo Bolo.

Phlox Douglasii? Yolo Bolo. Past flower and fruit.

Collomia tenella Gray. Snow Mountain. Common.

Gilia pungens Benth. Crevices of rocks, Snow Mountain.

Gilia aggregata Spreng. Snow Mountain.

Gilia Harknessii Curran. Common about the borders of meadows, Snow Mountain.

Gilia capillaris Kell. Allen's Springs; Hot Springs, Eel River and very abundant all about Snow Mountain; Mt. Sanhedrim, *J. W. Blankinship;* Hy-Am-Pum, *W. W. Price;* taller and less diffuse at the lower elevations.

Collinsia Torreyi Gray. Snow Mountain. Common.

Pentstemon Menziesii Hook. Snow Mountain; Yolo Bolo; Cobb Mountain; Mt. St. Helena.

Mimulus rubellus Gray. Snow Mountain. Common.

Mimulus primuloides Benth. Wet meadows, Snow Mountain.

Castilleia linariæfolia Benth. Snow Mountain; Yolo Bolo.

Castilleia miniata Dougl. Pubescent form. Cobb Mountain, *C. F. Leithold;* Snow Mountain; Yolo Bolo.

Cordylanthus Pringlei Gray. Lower slopes of Snow Mountain. Flowering in August and September.

Pedicularis semibarbata Gray. Bartlett Mountain; Snow Mountain.

Monardella odoratissima Benth. Snow Mountain.

Lophanthus urticifolius Benth. Snow Mountain. Growing in thickets of Ceanothus, Ribes, etc., the purplish heads surmounting them.

Polygonum Bistorta L. Meadows and banks of streamlets, Snow Mountain.

Polygonum Davisiæ Brewer. High rocky peaks, Snow Mountain.

Eriogonum umbellatum Torr. High rocky ridges, Snow Mountain; Yolo Bolo.

Eriogonum compositum Dougl. Snow Mountain; Yolo Bolo.

Eriogonum Lobbii T. & G. High rocky ridges near the monument, Snow Mountain. Flowers forming larger heads and of deeper rose-color than those seen in the Sierra Nevada.

Eriogonum ovalifolium Nutt. Abundant and forming dense tufts often a foot in diameter, the snowy mass of small leaves surmounted by short peduncles, bearing heads of whitish flowers which become at length rose-colored. Snow Mountain.

Eriogonum spergulinum Gray. Snow Mountain. Common about the borders of meadows.

Eriogonum hirtiflorum Gray. Common in Lake County. Dwarf at high elevations, but about Hough's Springs and on the lower slopes of Snow Mountain reaching so great a size that a single individual would fill several sheets of collecting paper.

Quercus chrysolepis Liebm. on Snow Mountain reaches an elevation of about 4000 feet, above that level dwarfing rapidly into its subalpine form, var. *vaccinifolia.* The ascent of the mountain is so abrupt that the phases of transition can be readily followed.

Taxus brevifolia Nutt. Deep cañons of Elk Mountain and on Snow Mountain.

Abies concolor Lindl. Snow Mountain, from 4500 to 6000 feet, also on Cobb Mountain, where it was collected by Mr. C. F. Leithold.

Abies nobilis Lindl. The most abundant tree of Snow Mountain above the altitude of 6000 feet.

Pinus Sabiniana Dougl. reaches about 3800 feet on Snow Mountain.

Pinus ponderosa var. *Jeffreyi* Gray is found on Snow Mountain from 5000 feet upward.

Pinus Balfouriana Jeffrey. Yolo Bolo.

Pinus Lambertiana Dougl. was found on Snow Mountain at greater elevation than any other pine, but in the higher altitudes the trees were dwarfed and distorted.

Veratrum Californicum Durand was abundant in the meadows of Snow Mountain.

Smilax Californica Gray. Yolo Bolo.

RANDOM BIRD-NOTES FROM MERCED BIG TREES AND YOSEMITE VALLEY.

BY W. OTTO EMERSON.

I found on arriving at the South Grove of Merced Big Trees some interesting birds peculiar to the higher altitude of the Sierra in summer. I spent June 17 and 18, 1893, in that section of the Merced Grove. I found it a slight hollow or flat of some four or five acres in extent where are eighteen or twenty trees of *Sequoia gigantea* scattered through the forest of sugar pines, yellow pines, cedars and firs.

The work of the pileated woodpecker (*Ceophlœus pileatus*) can be seen here and there spotted over the thick bark of the Sequoia. Many of the holes were six to eight inches across and ranging all the way from ten to thirty feet from the ground. I saw only one of these large woodpeckers as it flew through the trees.

I saw three of the white-headed woodpecker (*Xenopicus albolarvatus*). In the dead top of a pine stump some fourteen feet from the ground was a nest of a pair of these birds. After rapping on the stump I could hear the young squeakers calling for their parents. I watched the old birds for an hour or more collecting insects from the bark of the different evergreens to feed the ever hungry young ones. They always began at the lower part of the tree and gradually worked upward, zig-zagging around the tree to the top, then flying downward to the base of another tree. It would take at least half an hour before seeming to have enough insects to carry to the young. I supposed the birds to be gathering ants and larvæ of bark insects. It was the delight of one of this pair of woodpeckers to fly to a certain fir tree and have a pair of Louisiana tanagers (*Piranga ludoviciana*) chase it around the tree. I have no doubt but that the tanagers had a nest in the tree. While camped in the grove I saw five of these tanagers.

I noticed only two of the red-breasted sapsucker (*Sphyrapicus ruber*). One I watched every morning from my tent fly to the top of a tall burnt tree and rap its roll-call as a kind of warning may be to the flying insects. It would then sail out like a flycatcher, catch an insect, and return to the burnt tree-top. Its movements were very graceful and regular. As it dipped or circled around for this or that insect the sunlight catching on the red breast lit it up like a patch of flame.

The Californian woodpecker (*Melanerpes formicivorus bairdi*) was not uncommon. Harris' woodpecker (*Dryobates villosus harrissii*) was the only other species of Picidæ noted in the grove besides the red-shafted flicker (*Colaptes cafer*).

The blue-fronted jay (*Cyanocitta stelleri frontalis*) was twice seen, but was very shy and quiet, no doubt nesting.

The California purple finch (*Carpodacus purpureus californicus*) was observed several times, but had not paired off.

Juncos (*Junco hyemalis thurberi*) were in pairs, but not common.

One thick-billed sparrow (*Passerella iliaca megarhyncha*) was noted, seeming to have only arrived, as I found them common later above the Yosemite Valley.

Two spurred towhees (*Pipilo maculatus megalonyx*) were seen.

That most beautiful swallow, the violet-green, (*Tachycineta thalassina*) was seen to pass one morning on its way to the oak flats.

Audubon's warbler (*Dendroica auduboni*) was seen on one occasion passing hurriedly through the trees.

A male black-throated gray warbler was seen feeding amongst low bushes early one morning.

I saw four of the beautiful hermit warblers (*Dendroica occidentalis*); all were feeding in low bushes along the mountain streams.

The California creeper (*Certhia familiaris occidentalis*) was observed several times running up and down first one tree and then another. All were busy hunting food for young.

The slender-billed nuthatch (*Sitta carolinensis aculeata*) was seen but once.

I saw one Townsend's solitaire (*Myadestes townsendii*) the day we arrived in camp at the grove. I collected a specimen at Haywards some ten or twelve years ago, the only one I have heard of being taken so near the Coast.

A ruby-crowned wren (*Regulus calendula*) was observed feeding in a fir tree.

The notes of small thrushes (*Turdus*) were heard several times, but the birds being so shy, I could not get a glimpse of them.

The following birds were observed from June 20th to 25th in the Yosemite Valley. It is a garden spot on a grand scale for bird life. I think that the valley is one of the best spots in California to spend a season, collecting. Here are found trees and shrubs of the white, black and chestnut oaks, yellow, silver and sugar pines, red cedar, Douglas fir, willows, cottonwood and alders, manzanita, chemise, chaparral, wax-berry, deer-brush, wild rose, California azalea, wild coffee, dog-wood, mountain mahogany, wild cherry, currant and gooseberry.

Killdeer (*Ægialitis vocifera*) were seen along the Merced River banks.

The day we entered the valley, June 19th, a bevy of downy

young of the plumed partridge (*Oreortyx pictus plumiferus*) with the old ones ran across the road and scattered among the leaves. Every morning in my walks before sunrise I would see the partridges dusting themselves in the road. I noticed none of the California partridge while in the valley. A young lady of our party caught two downy young of the sooty grouse (*Dendragapus obscurus fuliginosus*) on the trail going to Nevada Falls June 21st. The old birds would not respond to the peeping of the young and venture from the bushes and the young were allowed to go.

Mourning dove (*Zenaidura macroura*) was seen but once.

A Cooper's hawk (*Accipiter cooperi*) was seen sailing among the firs and pines on Glacier top, at an altitude of 3300 feet.

A golden eagle (*Aquila chrysaëtos*) appeared once high above the Yosemite Falls to let us know that Eagle Point above our camp was named for him.

Belted kingfishers (*Ceryle alcyon*) were observed along the river.

Four species of woodpeckers were seen in the valley, Harris', white-headed, Californian and red-shafted flicker.

The peculiar, lonely notes of a California poor-will (*Phalænoptilus nuttalli californicus*) could be heard nights high up on the cliffs above the valley.

The black swift (*Cypseloides niger*) is very common high up in all the cliffs, particularly the face of Glacier Point. I have sat on the rocks of the trail leading up to the point and had them sail close over my head and could see them below me moving back and forth about the face of the cliff.

Associated with the black swifts were several of the white-throated (*Aëronautes melanoleucus.*)

The only humming-bird observed in the valley was the calliope (*Trochilus calliope*). One came within eighteen inches of my feet to the flowers of a milk-weed. I often noticed them about the young fir tops where they may build their nests. I have a male specimen which was shot in my orchard at Haywards from a flowering peach tree, March, 1880.

Ash-throated flycatchers (*Myiarchus cinerascens*) were several times seen in the oak trees near our camp and along the fences in the meadows.

Western flycatcher (*Empidonax difficilis*) was observed but once along the bushy banks of the Merced River.

I heard the notes of the olive-sided flycatcher (*Contopus borealis*) on several occasions in the high tree tops along the high trails of the valley.

The western wood pewee (*Contopus richardsonii*) was not uncommon, usually in pairs. A nest was being built in an oak near my tent.

Blue fronted jays were tolerably common in the deep forests and cañons, preferring the cedars and firs.

Clarke's nutcracker (*Picicorvus columbianus*) was seen on two occasions, once on Sentinel Dome, 8122 feet altitude.

A single female blackbird (Agelaius) was twice seen flying across the meadow by the river, and a western meadow-lark (*Sturnella magna neglecta*) was noticed in the same locality.

Bullock's orioles (*Icterus bullocki*) were seen in the oaks near camp.

Brewer's blackbird (*Scolecophagus cyanocephalus*) was nesting in trees near the lower hotel.

In the forenoon of June 25th, while camping near the old saw mills not far from Mr. Hutchings' cabin, a pair of evening grosbeaks (*Coccothraustes vespertinus montanus*) came to our table, placed beside a white oak, to pick up crumbs for their young. They were not afraid of anyone in camp.

The purple finches also came to camp every day for food.

Western chipping sparrows (*Spizella socialis arizonæ*) were noted several times about camp. I think they had young in an old apple orchard near by.

Juncos were met with only in the deep forests of pines, cedars, and firs, and were not paired as far as I could judge.

A variety of song sparrow was not fully identified. Mr. Shelley Denton collected specimens there in 1881, which I am sure were *Melospiza fasciata montana*.

Lincoln's Sparrow (*Melospiza lincolni*) was seen in the meadow.

Thick-billed sparrows were seen several times. I sat by the trail to Glacier Point where it passes through a stretch of manzanita to hear the song of this species. It is a loud, clear, whistling

note, much like the notes of the purple finch. After singing several notes they would dive into the brush like the wren-tit.

Spurred towhees were not uncommon all through the valley, and the green-tailed towhee (*Pipilo chlorurus*) were seen about bushes near camp. Mr. Denton collected a number of them in his visit here in 1881.

The black-headed grosbeak (*Habia melanocephala*) was very common all through the valley. They came into camp in pairs and helped themselves from the table, not seeming afraid of anyone; no doubt had young near by. The males were on good terms with each other, eating from the same piece. They repaid us by singing from the tree tops at first light of day and last at night.

Lazuli bunting (*Passerina amœna*) was not common in the valley and only seen about orchards. Louisiana tanagers were common all through the thickest forests, preferring the tall firs. I heard no notes from them and they did not appear to have paired off.

The notes of the western purple martin (*Progne subis hesperia*) were heard in some old oaks near the Stoneman House, like the old farm-place of my eastern home. At two camping-places in the foothills I noticed young martins.

Violet-green swallows were seen in company with the two species of swifts high up on the Glacier Point trail. They no doubt nest in the cliffs as very few trees were suitable on the wall ledges.

The only vireo observed in the valley was the warbling (*Vireo gilvus*).

Lutescent warblers (*Helminthophila celata lutescens*) were not common and only twice observed along the river banks in thick brush.

Andubon's hermit and yellow warblers were seen but once during my short stay.

A pair of Macgillivray's warblers (*Geothlypis macgillivrayi*) were seen in thick azaleas near the river and acted as though they had a nest near the spot.

American dipper (*Cinclus mexicanus*). The first bird to greet me on getting into the valley was this water spirit, at the foot of

Cascade Falls where it comes leaping and rolling off the granite boulders to the river, the ideal home of the dipper.

The California creeper was seen on two occasions on cedar trees.

Slender-billed nuthatches were seen in white oaks once, but no individuals of *Sitta canadensis.*

The mountain chickadee (*Parus gambeli*) was seen on one occasion while passing through a mass of firs at summit of Glacier Point. The surrounding conditions were such that I expected to find it a common bird.

The whistling notes of a pallid wren-tit (*Chamæa fasciata henshawi*) were heard in a manzanita thicket half way up to Glacier Point.

A ruby-crowned wren was seen in a young fir tree near our camp at Bridal Veil Fall.

Townsend's solitaire was twice seen and a specimen taken at Diamond Cascades below the Vernal Falls.

The jewel of all the high Sierra singers is the western robin (*Merula migratoria propinqua*). It perches at the top of a pine or fir and sings till the setting sun is down, breaking forth now and then with a few notes till night begins. At first break of morning light, about three o'clock, his song is in greatest perfection; after greeting the day he is then quiet excepting a short low bar of love to his nesting mate. Full-grown young with spotted plumage were about our camp all the time.

BOTANICAL NOMENCLATURE.

BY KATHARINE BRANDEGEE.

It must be confessed that the present state of nomenclature is hardly an encouragement to those attempting to reform it. Almost every author of a systematic treatise has a system of his own, differing more or less from that of his neighbor, and in too many cases his meaning can only be made out by the average botanist through the quoted "synonymy." This state of things not only furnishes the "biological" botanist with his keenest weapons against systematic work but lessens to a marked degree

the interest felt in the science by the large body of botanists, who not being in command of extensive libraries find themselves unable to judge between the conflicting claims of the various new names, with which those familiar to them are to be supplanted.

The rigid law of priority, judging by what its attempted enforcement has produced, is not competent to give us a stable nomenclature. There are too many cases which under such a rule must always remain in doubt, and it is further complicated by questions of sufficiency of publication, and the right to amend names which open vistas of perpetual argument. It must be apparent too that the claim of strict justice which is supposed to underlie the law of priority is a delusion. It puts the work of the most ignorant and incompetent on a level with that of the greatest scientest, offering a direct premium for hasty and inconsiderate work, and yet no permanent advantage can accrue to the vain glory of anyone, for it is only a question of time and settled nomenclature when author-citation will be discontinued in systematic, as it now is in popular and semi-scientific work.

It would seem that there should be some limit to the raking up of obscure and forgotten species and genera, especially as they were in the great majority of cases neglected for good reason, and have in many instances become recognizable only by the advance of knowledge or by a process of exclusion. A law of limitation has been found necessary in the property affairs of mankind, and such a law with a period of—say fifty years—might give us relief from that class of "scientists" whose researches into the mysteries of nature consist in trying to find out what our predecessors knew, instead of doing their little best to add to the world's knowledge.

A tendency to legislate for one's neighbors is usually found in indirect ratio to fitness for such an office. No code of laws yet exists which is able to provide for all occasions, and the more minutely rules are drawn, the greater is the list of exceptions. The citing of publications, for instance, may safely be left to the example of those who remember in their works, that the saving of labor to others is the object of citation, and the question of the

initial letters of species will settle itself in time into a matter of convenience, there being no real rule of grammar involved—the Romans as every one knows had only one kind of letters—all capitals.

Rules relating to the formation of systematic names had perhaps better be only recommendatory. The aspect of the purist in the language of science is one of the most ridiculous things the world has encountered. The Latin of modern science would at its best be a foreign language to Cicero, and the attempt to exclude names not formed according to the best models is especially characteristic of those who, having rather late in life acquired a "little Latin and less Greek," are painfully anxious to advertise the fact.

JOHN LORA CURTIS.

John Lora Curtis, the young California araneologist, who died in Oakland on February 19, 1893, was a life-long invalid. He was confined to a wheel-chair for thirteen years, more than half of his short life. He was so weak that even a book was too large a burden for his hands. Yet he was a better student and lover of nature than many stronger men. His education was necessarily desultory. He began his study of spiders in his sixteenth year, and did his collecting of specimens mostly at second hand, through friends and correspondents. In this way he collected and preserved more than two hundred species of spiders, almost altogether from California. He estimated that, at a reasonably low figure, fifty of these were new to science.

Lack of funds kept his library small, and he had not been able to secure such works on American spiders as Keyserling's, therefore he was very diffident about offering to publish for new what might prove to be species already described. Had his life been spared only a few years longer he surely would have added new forms to the list of described spiders of California. As it is, it remains the duty of some arachnologist to work over the specimens left by him with their accompanying notes.

Just a few days before his death he had the pleasure of reading the proof of his first (and last) published article: *A New*

Jumping Spider, in Zoe, vol. iii, p. 332. He had previously prepared an article on a species of *Theridion*, of about fifteen or twenty ordinary octavo pages, illustrated with over fifty figures, mostly colored, and finished with great care. This contains, beside the description of the little spider, its life history thro' two generations, each represented by many individuals, noting at least six fairly distinct varieties. The publication of this article has been delayed by the difficulty in reproducing the colored plates.

Rev. Henry C. McCook, the distinguished araneologist of Philadelphia, in writing of Mr. Curtis says: "A little while before I had prepared material for a new species of spider which I had dedicated to him, attaching to it his name. The drawings of this are done, and the engraving of *Pachygnatha Curtisi* is already upon the plate of the lithographer."

His interest in spiders was united to a lively interest in other branches of natural history and social progress. His aim was to prepare a descriptive list of the spiders of California. When he foresaw his early death he hoped some stronger hand would continue and finish the work. J. D. L.

A NEW STATION FOR ASPLENIUM SEPTENTRIONALE. Mr. Brandegee sends specimens from San Pedro Martir, a high mountain nearly east of San Quintin, in Baja California. This is five or six hundred miles west of the nearest previously recorded station, which is, I think a mountain in New Mexico, called Ben Moore, where Dr. J. M. Bigelow detected it in 1851. Mr. Charles Wright collected it probably at the same place a little later. Next, Hall & Harbour found it in Colorado, and Mr. Brandegee obtained it later in the Grand Cañon of the Arkansas.

In the Old World its range is from Great Britain to the Himalaya Mountains. It is strange it has never been found in the eastern part of North America. D. C. EATON.

RECENT LITERATURE.

A Jumping Mouse (Zapus insignis Miller), new to the United States. By GERRIT S. MILLER, JR. Proc. Biol. Soc. Wash., viii, April 22, 1893, 1–8. This species described by Mr. Miller in Am. Nat. xxv, August, 1891, 472, from New Brunswick, has since been collected in New Hampshire and New York.

Description of a New White-footed Mouse from the Eastern United States. By GERRIT S. MILLER, JR. Proc. Biol. Soc. Wash., viii, June 20, 1893, 55-69. *Sitomys americanus canadensis.*

List of Mammals Collected by Mr. Charles P. Rowley, in the San Juan Region of Colorado, New Mexico, and Utah, with Descriptions of New Species. By J. A. ALLEN. Bull. Am. Mus. Nat. Hist., v, April 28, 1893, 69-84. Thirty-four species are enumerated with annotations and critical notes. The following are described as new: *Zapus princeps* from Florida, La Plata County, Colorado; *Arvicola (Mynomes) aztecus* from Aztec, New Mexico; *Sitomys auripectus* from Bluff City, Utah; *Sitomys rowleyi* from Nolan's Ranch, Utah; *Reithrodontomys aztecus* from La Plata, New Mexico.

Introduction to a Monograph of the North American Bats. Notes on the Genera of Vespertilionidæ. By HARRISON ALLEN, M. D. Proc. U. S. Nat. Mus., xvi, pages 1-31.

Rediscovery of the Mexican Kangaroo Rat, Dipodomys phillipsi Gray. By C. HART MERRIAM, M. D. With Field Notes by E. W. NELSON. Proc. Biol. Soc. Wash., viii, July 18, 1893, 83-96. A series of 67 specimens from the Valley of Mexico, after the species had been known but from a single specimen for fifty-two years.

Systematic and Alphabetic Index to New Species of North American Phanerogams and Pteridophytes, Published in 1892. By JOSEPHINE A. CLARK.

This index is one of the most useful publications of the National Herbarium. It is, however, marred by a very serious fault. Instead of being an index of new species, it is in very large part an index of changes of nomenclature, and there are

furnished no means of determining to which of these classes any given name belongs. For instance, Miss Vail is credited with a list of species of Meibomia, only one of which was described by her, and none at the place cited; and McMillan is credited with six species of Pleurolobus. Only the comparatively small number of botanists who concern themselves with changes in nomenclature are likely to remember that these are but familiar species of Desmodium, many of them described by Linnæus. Professor Greene is credited with fifteen new species of Blepharipappus, which are only renamed Layias, and twenty-four species of Linanthus, all but one of them long-described and well-known Gilias. In like case are all the new species of Platystemon, Bicuculla, Caprifolium, Jacksonia, Lesquerella, Nasturtium, Stellularia, Hesperalcea, Kuhnistera, Kunzia, Lutkea, Therofon, Stellaria, Arracacia, Myrrhis, Symphoricarpus, Caprifolium, Ereminula, Lappula, Kœllia, Tullia, Salvia, Ramona, Mirabilis, Neckeria, Razoumofskya, Manihot, Scoria, Ostrya, Leptorchis, Corallorhiza, Gyrostachys, etc., etc. In a number of instances the same species—even those considered the same by their author—is listed twice, as in the case of *Fritillaria coccinea* & *Fritillaria recurva coccinea*, *Callichroa nutans* & *Blepharipappus nutans*, *Plagiobothrys Californicus* & *P. campestris*. These serious errors are so easily remediable by the use of different type or by double citation that we hope to see the next list free from them.

Additions to the Phænogamic Flora of Mexico. By B. L. ROBINSON and H. E. SEATON, being No. 3 of the New Series of Contributions from the Gray Herbarium of Harvard University. In it twenty-nine new species and several varieties are described.

In the *Torrey Club Bulletin* for July, Dr. Britton has been doing useful work in looking up the authenticity of some of Rafinesque's genera recently attempted to be revived. *Pseva*, which Dr. Kuntze has taken as the older name of *Chimaphila*, in which action he was precipitately followed by Professor Greene, is shown to have no foundation. It rests upon Rafinesque's statement, published in the Journal de Physique, 1819, that "*Chimaphila* Pursh is antedated by *Pseva*, Raf. Med.

Rep. 1809." Dr. Britton says: "I wish to record here that I have recently gone over these papers line by line, and can find no allusion to *Pseva* in any of them, nor have I met with the name in any of Rafinesque's writings except at the place where he claims it as noted above." The attempt to resurrect an earlier name for *Polanisia* is disposed of as follows: "*Jacksonia*, Raf. Med. Rep. (II) v, 352 (1808). Professor Greene has argued in Pittonia ii, 174 and 274 that this name should replace *Polanisia* Raf. Journ. Phys. lxxxix, 98 (1819) but I cannot see that his position is tenable. *Jacksonia* is published at the place above cited as follows:

Jacksonia (trifoliata)=*Cleome dodecandra* L. Now *Cleome dadecandra*, L. Sp. Rl. 672 is a well-known Indian species. Rafinesque evidently followed Michaux in supposing that it was North American, and *Cleome dodecandra* Mich. Fl. Bor. Amer. ii, 32, 1803, is indubitably the same as *Polanisia graveolens* Raf. Amer. Journ. Sci. i, 379 (1819) and not at all the plant of Linnæus. In matters of nomenclature we must be exact and so it seems to me that *Jacksonia* Raf. can only apply to the Asiatic, Linnæan, *Cleome dodecandra*. I do not find any allusion to Jacksonia in subsequent writings of Rafinesque, and presume that he discovered his error." In the meantime, however, Professor Greene has made haste to transfer* the species of *Polanisia* to *Jacksonia* and under the head of "Corrections in Nomenclature" †to transfer the three dozen species of the Australian, Leguminous genus *Jacksonia* to another name.

The Range of Amorpha fruticosa. By JOHN M. HOLZINGER of the U. S. National Herbarium. Under this heading Mr. Holzinger prints in Erythea for June some notes on specimens belonging to the U. S. National Herbarium which show that the range of the species is considerably farther extended than had been supposed. In the course of his examinations he found that the three sheets of this group belonging to Professor Greene's herbarium, two of them labeled *A. Californica* Nutt. and one *A. hispidula* Greene, were in his opinion incorrectly named. Concerning them he wrote: "There seems to have existed a long

* Pitt. ii, 174.

† Erythea, 114.

standing confusion of *Amorpha fruticosa* with *A. Californica* in the region of Arizona, New Mexico and Southern California that must have led Professor Greene to describe Nuttall's true *Amorpha Californica* as a new species, *A. hispidula*." Professor Greene seems to have become somewhat enraged, and in an appended note bristling with remarks concerning Mr. Holzinger's "dogmatism," "bald opinions," "entirely gratuitous suppositions," etc., gives the luckless botanist who has presumed to differ from him, a sound verbal spanking. Nevertheless Mr. Holzinger is entirely correct as everyone at all conversant with the flora of California knows, and Mr. Greene as entirely wrong. Indeed his descriptions of *A. Californica* and *A. hispidula* in Flora Franciscana convict him sufficiently. In the brief description there given he omits from the former, apparently intentionally, for as it appears in all descriptions he can hardly have been ignorant of it, Nuttall's significant phrase "petioles furnished with minute glandular scales." At the risk of being accused of "dogmatism" I venture to state that *A. fruticosa* enters Southern California where it has been collected not only by Dr. Palmer, but also by George W. Dunn who found it in the mountains near Julian something like forty miles north of the boundary. It grows also about the lower elevations of San Pedro Martir in Baja California, which is perhaps its southern limit. The range of *A. Californica* as at present known is from the southern border of Mendocino County along the Coast Range in various localities to San Pedro Martir, where it has recently been found on the summit plateau. In the Sierra Nevada foothills it appears to have been collected only at the Alabaster Cave not far from Auburn. The only habitat known for *A. hispidula* is the mind of Professor Greene.

Fourth Annual Report of the Missouri Botanical Garden contains, besides the usual Reports, etc., a list of plants collected by Albert S. Hitchcock in the Bahamas, Jamaica, and Grand Cayman, 132 pages, and four plates of the new species, *Pavonia Bahamensis* Hitchcock, *Anastraphia paucifloscculosa* Wright, *Euphorbia Blodgettii* Engelm., and *Eragrostis Bahamensis* Hitchcock. The remainder of the volume is occupied by "Further Studies of Yuccas and their Pollination" by William Trelease.

Professor Trelease adopts, in accordance with Mr. Baker's views, the name, "Hesperoyucca" for *Yucca Whipplei*, which he separates as a generic type. The article is accompanied by many excellent plates.

North American Sileneæ and Polycarpeæ. By B. L. ROBINSON. Being the fifth of the new series of Contributions from the Gray Herbarium. This tentative revision is preliminary to treatment of the Caryophyllaceæ in the Synoptical Flora and its object is stated to be "chiefly to secure aid through criticisms, and to call attention to such species, especially in the genera *Silene* and *Lychnis* as are still imperfectly known, so that if possible more complete material of them may be secured before final revision." The author evidently doubts the validity of certain accepted species of Silene and his remarks upon the distortion of the flowers of the type of *Silene Lyalli* by a well-known fungus are very suggestive. One new species of Lychnis, *L. Tayloræ*, and two of Silene, *S. Watsoni* (changed from *Lychnis Californica*) and *S. scaposa* are proposed. *S. simulans* is reduced to *S. laciniata*, *S. incompta* to *S. Bridgesii*, *S. plicata* to *S. Thurberi*, *S. Shockleyi* to *S. montana*, *S. Macounii* & *S. monantha* to varieties of *S. Douglasii; S. purpurea* is admitted "but not seen by the author." With the treatment of Lœflingia we do not agree and hope that fuller material will convince the author that there are not three American species. The appearance of a revision of the remaining genera is awaited with much interest, and from Dr. Robinson's opportunities and well-known conscientiousness in research it cannot fail to be valuable.

Contributions from the Herbarium of Columbia College, No. 35. An Enumeration of the Plants collected by Dr. Thomas Morong in Paraguay, 1888-1890. By THOMAS MORONG and N. L. BRITTON, with the assistance of MISS ANNA MURRAY VAIL. Reprinted from Annals of the New York Academy of Sciences vol. vii. The paper is of much consequence to the flora of South America. It has the interest which always attaches to botanical papers where the author has been at once collector and writer.

Forest Influences—Bulletin No. 7 of the Forestry Division, U.

S. Department of Agriculture. This is a series of papers by B. E. Fernow, M. W. Harrington, Cleveland Abbe, and G. E. Curtiss, on a subject of great economic importance.

Grasses of the Pacific Slope, Part ii, being Bulletin No. 13 of the Department of Agriculture, Division of Botany. This part, issued after the death of Dr. Vasey, contains fifty plates with descriptions, titles, and index and completes the volume. It is a welcome addition to the literature of the Grasses.

Erythea for July contains some new species of Californian Fungi by J. B. Ellis and B. M. Everhart; an account of A New Station for *Notholæna tenera* by S. B. Parish; Remarks on the Genoa Congress by Dr. Otto Kunze, and under the title "Novitates Occidentales" the usual new species, of the customary value, by Professor Greene.

A Dictionary of Botanical Terms: A. A. CROZIER. Henry Holt & Co., New York 1892.

The progress in the study of natural sciences during the later years has very considerably extended our points of view in many directions. In botany, for instance, investigations in morphology, anatomy and physiology have been carried out to such an extent as to make the introduction of new terms necessary, while many of the terms formerly used have been dropped. This introduction of new terms and change of older ones has caused considerable trouble to both authors and students.

It is, therefore, very natural that a terminology thoroughly brought up to date would be welcomed all the world over, since a work of that kind would be both an assistance and guide to our reading and would enforce uniformity in using the terms as generally adopted. A work of that kind, it seems to us, should only be the product of careful literary research made by several specialists in their respective lines, in order to give a reliable result. We, therefore, felt very much surprised to see a book of this scope written by a single author. A mere look in the book soon convinced us that a very large number of terms had been compiled, and so far the book is of some use.

But since this book will undoubtedly enter the libraries of our

universities and colleges, we feel the more at liberty to discuss in how far it is to be recommended as a suitable dictionary for the study of botany.

It appears, only too clearly upon careful examination, that the author of the present work has not possessed full knowledge of any of the many botanical lines which were supposed to be represented by modern or old terms in this book.

The literary part of the work has not been done carefully, and the definitions of the various terms are very poor, and absolutely incorrect in many cases. What we hoped to find was not only an explanation of the words themselves, when taken from foreign languages, their derivation for instance, but also their true signification in botany, as they have been or are still applied by different authors. But in this respect the book does not give much information, indeed it seems as if the whole subject has been treated more like a mere compilation without criticism rather than representing the result of literary research and original investigation.

It is very unsafe to quote terms from a single article without trying to find out by original and confirmatory investigations what it really means. Instead of finding a uniformity in terms, as applied for instance to a series of homologous organs, we find often great confusion. In many cases the terms themselves are not correctly defined, besides a number of quite common ones are entirely overlooked.

By considering the morphological terms it is striking to see, that the most essential points are often not given, and it seems necessary to give a few citations:

"Cotyledon" is said to be "the first leaf or leaves of a plant;" we wonder if this also applies to *Cryptogames?*

"Nut" is defined as being "the fruit of certain trees and shrubs, consisting of a hard shell enclosing the seed." The principal characteristic, that a nut is indehiscent, is omitted.

"Nutlet" is "a small nut, or nutlike seed or fruit as many achenia." We doubt whether it has ever been applied to seeds.

"Paraphyses" are defined as "sterile filaments," while a filament is defined as "the stalk of an anther."

"Utriculus" is referred to "utricle" as being "a fruit with

inflated, membranous pericarp;" the very well-known utriculus of *Carex* is not mentioned and is not to be compared with such a kind of utricle.

About "drupe" is only said that "it occurs in peach, almond, and cherry, being characterized by having a bony endocarp;" nothing is said about the fleshy exocarp.

"Nectary" is, according to this dictionary, only "the part of a flower which secretes nectar." The common extra floral nectaries are silently passed by, and this is the more curious when we see under "gland," "also applied to certain wart-like swellings which are not secretory, [sic] as the abortive teeth at the base of the leaf of peach and cherry"! These glands are certainly secretory, however. "Secretory" is not defined.

"Scape" is defined as "a peduncle rising from the ground, as in Sanguinaria, *i. e.*, a stalk from the root." The author has probably never seen the large rootstock of this common plant.

"Palet" of the grasses is defined as "the inner bract or chaff." This organ is, nevertheless, wanting in several genera; then the flowering glume would be the same as the palet, a terminology which is untenable. The singular position of this organ, the palet, with its back towards the mother-axis, seems entirely unknown to the author.

If we turn to the anatomical and physiological terms, we find these still more defective, and it is often utterly impossible to draw any correct conclusion from the definitions of the various tissues, when compared with each other. "Cuticle" is said to be "the outer cell-wall of the epidermis;" "Leptome," which is credited to Potonié, is attributed to "vascular Cryptogames only," and "Hadrome," also credited to Potonié, and defined as "the phloëm-like portion of fibro-vascular bundles in vascular Cryptogames." These two terms, leptome and hadrome, would then be identical, while in reality hadrome is used instead of the term xylem. Under "Phloëm" we are told that "the inner bark is derived from the phloëm and the wood from the xylem." Haberlandt was the first to introduce these terms, not Potonié. The author ought to have studied Haberlandt's Physiologische Pflanzen-anatomie—he would then have been spared much trouble, besides would have been able to define these terms correctly.

In the definitions of Mestome, Stereome, Pericambium, and Endodermis, so plainly described by Schwendener, De Bary and other authors, it is surprising to find such confusion as occurs in this book. Mestome-sheath and Parenchyma-sheath are not defined at all, although the preface promises us very many terms from German botanists. Cells as ducts or reservoirs are represented only by "Laticiferous-vessels, *i. e.*, anastomosing tubes." De Bary's comparative anatomy would have been a great help to the author, and would have shown him that far from all of these are anastomosing. Reservoir is not defined, not even the common tannin reservoirs.

When these common terms are so badly treated, what can be expected in regard to the more complicated ones?

We merely need to look for the definition of "Chlamydospore" about which we learn that "they are formed asexually in Mucorini by free-cell formation." The words "transpiration" and "respiration" are so defined as to render it evident that the author is entirely ignorant of even elementary physiology.

In regard to recent cytological terms the book shows so many misinterpretations and omissions that it is difficult to see which authors, if any, have been consulted.

And when finally we call attention to some of the most elementary terms as "aqueous" defined as "nearly colorless, see hyaline," and "Eu" used as abbreviation and indicating, "when used after a species, that this is, certainly, a well-defined species, not a variety"! (while as used by Gray it indicates that the species occurs in Europe also,) we have probably given sufficient data to enable the reader to estimate the value of this book as "a guide to teachers and students"!

Considering this publication as it stands, it is hardly to be believed that the botanists, whose names appear in the preface, could really have given any critical thought either to the manuscript or to the proof of this book; if so explanations are in order.

There is, on the other hand, a work to which the author does not refer, although many of the definitions show an unmistakable resemblance to the corresponding ones in it. The Century Dictionary seems to have been used very freely, and it is, there-

fore, very natural that mistakes and misinterpretations should occur frequently. The botanical part of the Century Dictionary is largely a compilation of words and definitions without due criticism.

In reference to the reviews of this book which have appeared in the Botanical Gazette and in the Bulletin of the Torrey Botanical Club, one of two conclusions appears inevitable. Either the writers are themselves ignorant of modern botany, or they have followed the common and reprehensible practice of reviewing a book without having read it. The latter is the probable and more charitable conclusion.

In contrast to these complimentary reviews of the book in question, we can only say it would have been much more beneficial to the study of botany in this country if the book had never been printed. THEO. HOLM.

PROCEEDINGS OF SOCIETIES.

CALIFORNIA ACADEMY OF SCIENCES. *May 1, 1893.* President Harkness in the chair.

Donations to the museum were reported from S. J. Holmes and W. L. Watts.

The Librarian reported 236 additions to the library.

Dr. George H. Horn, the well-known entomologist, was introduced by the President.

Walter E. Bryant read a paper on the "Variations of the Bill of the California Jay."

William L. Watts read a paper entitled "Notes on Quicksilver Deposits in California."

June 5, 1893. President Harkness in the chair.

Donations to the museum were reported from W. W. Price, Mrs. R. M. Austin, W. L. Watts, Gustav Eisen, Mrs. Geo. Buttner, Mrs. C. A. Boland, Charles Fuchs, Frank E. Harris, F. W. Gill.

The Librarian reported 352 additions to the library.

Dr. Gustav Eisen read a paper on "Recent Investigations on the Pollination of the Fig."

Walter E. Bryant read a paper on "Some Cases of Albinoism in California Mammals," with exhibition of specimens.

CALIFORNIA BOTANICAL CLUB. *May 8, 1893.* Miss Eastwood in the chair.

The following were elected to membership: Dr. C. F. Clark, Miss Anna T. O'Brien, Miss Alice Derrick, Dr. Mary G. Campbell, Miss Isabella D. Clark, Mrs. Jennie C. Kahler, Mrs. Ida M. Blochman, Miss G. M. Potter, Charles P. Grimwood, Mrs. C. E. Quigley.

May 25, 1893. President Dudley in the chair.

Prof. W. R. Dudley spoke on his investigations of the polarity of the leaves of certain species of Wyethia and desired notes on the subject from observers.

June 5, 1893. Dr. Gustav Eisen in the chair.

Mrs. Clara Ferrer and Prof. F. H. Hillman were elected to membership.

NOTES AND NEWS.

The zoologically little known northern portion of the peninsula of Baja California has been visited this year by two parties, both bringing back good collections of mammals, birds and reptiles. Messrs. Anthony and Thurber paid attention principally to birds and mammals, securing some new forms of the latter. Mr. Anthony's previous visit in 1889, supplementing the researches of Mr. Belding, leaves but little to be hoped for in the way of new forms of birds. The objective place of both expeditions was the high mountain San Pedro Martir. Messrs. Stowell and Lunt, of Leland Stanford Jr. University, spent nearly two months in the same region this summer and obtained a good general collection, especially of the reptiles, and have made some valuable observations on the mammals and birds, especially on the status of *Tamias obscurus.* Both parties are to be congratulated on their successful work, and the results when published will add greatly to our knowledge of the peninsula

fauna, where it blends to some extent with that of Alta California.

A new illustrated monthly journal, devoted to the nests and eggs of birds, is soon to appear under the editorship of Mr. H. R. Taylor, of Alameda, who is already known to oologists through these columns.

Mr. Charles A. Keeler has returned from a voyage around Cape Horn to New York, much improved in health from a cruise of over four months.

Mr. J. W. Blankinship has returned from a six weeks' collecting trip in Northern California, with a large collection of plants, many of them rare in herbaria. Among them may be mentioned *Delphinium uliginosum*, *Astragalus Rattani*, *Howellia limosa*, *Phacelia Rattani*, *Mimulus nudatus*, *Eriogonum tripodum Brodiæa stellaris*, *Brodiæa rosea*, *Fritillaria pluriflora*, *Damasonium Californicum*.

The Herbarium of the California Academy of Sciences, by far the most important west of the Mississippi, is rapidly increasing in size. During the present year it has already been augmented by about 20,000 sheets. Besides the continual additions made by its curators in California, it has lately received by the generous kindness of the Gray Herbarium, the private collection of Dr. George Thurber; from Professor C. S. Sargent, of the Arnold Arboretum, a complete and carefully classified set of the trees and shrubs of that fine botanic garden. From Miss Eastwood it has received the plants collected by her during the whole of the last summer in Colorado and Utah; from W. H. Shockley, all the duplicates of his herbarium; from T. S. Brandegee, all the duplicates of his collections in California and Baja California; and from corresponding botanists, smaller collections too numerous for mention. These, in addition to the usual purchases, make a very large total for the first half of the current year. The permanent mounting of the plants on sheets of white paper is in steady progress. The mounting paper of the herbarium is of somewhat different dimensions from the ordinary standard in America, the sheets being 11x17 inches.

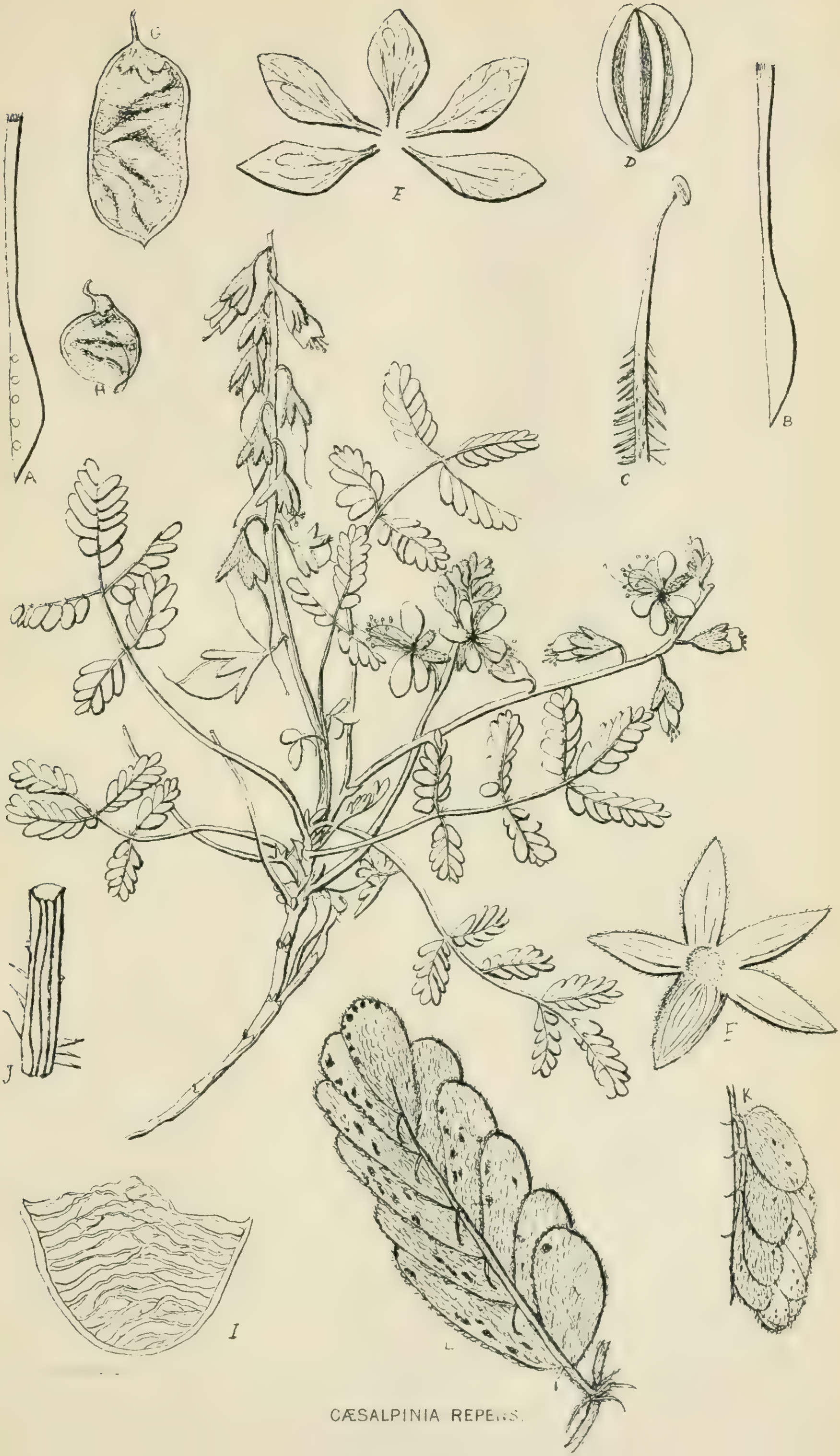
Professor Daniel C. Eaton, Yale University, New Haven, Conn., desires specimens of Sphagnum, or Bog Mosses, from California. They have been found in swamps near Mendocino City; at the head of Williams Lake, near Lassen Peak; in wet meadows, Mariposa Grove; in bogs near Kings River; Mt. Dana, Mt. Brewer, Upper Tuolumne Cañon, Yosemite Valley in the spray of Vernal Falls. The following instructions for collecting and preserving should be noted. They may be expected anywhere in cold bogs:

"All the plants for one series of sixty specimens should be gathered at one time and place, to avoid the chance of mixing two different forms under one number. The plants of dense habit of growth should be separated into broad, thin specimens while fresh, cleaned of foreign matter, and preserved in botanizing portfolios in the usual manner, *taking care not to subject them to any severe compression. Just enough pressure to keep them flat is enough.* Floating plants, such as the plumose forms of *S. cuspidatum*, are best prepared by spreading the specimens on letter-paper, as is usual in preserving the more delicate seaweeds. If the collector has no means of pressing the specimens, they may be gathered in bulk, and, when air-dried, sent in packages to Professor Eaton, who can have them softened and spread out for drying at some convenient time. Care should be taken to note the place and time of each collecting, and the approximate height of the station above sea-level."

Professor C. H. Gilbert and Professor O P. Jenkins, of the Stanford University, have joined Dr. Barton W. Evermann, of the U. S. Fish Commission, in an expedition to examine the headwaters of the Columbia in regard to the fish fauna, the obstructions to the ascent of salmon, and the location of a salmon hatchery.

Professor W. E. Ritter, of the State University, has spent a part of his vacation in making, with the assistance of several of his students, a biological reconnoisance of Santa Catalina Island.

Professor C. H. Tyler-Townsend, of the Agricultural College, Las Cruces, New Mexico, has taken the position of Curator of the Scientific Institute at Kingston, Jamaica.



CÆSALPINIA REPENS.

A. MILLS.

GILIA SUPERBA.

ZOE
A BIOLOGICAL JOURNAL

Vol. IV. OCTOBER, 1893. No. 3.

SOUTHERN EXTENSION OF CALIFORNIA FLORA.

BY T. S. BRANDEGEE.

The flora of the Peninsula of Baja California has usually been considered to be nearly the same as that of Southern Alta California, and Mr. Hemsley for that reason has given it no place in his Botany of the Biologia Centrali-Americana. A region extending through nine degrees of latitude, having California for its northern boundary and its southern portion lying within the tropics, with its northern vegetable life controlled by the alternation of winter and summer and its southern dependent on tropical rains, cannot possess a similar flora throughout its entire length.

There is a point situated between these extremes of latitude and differences of climate where there is a change in the flora, a change from that of the south to one that is in great part Californian. The middle latitudes of the Peninsula do not seem to have any well defined seasons of vegetable life, and the time of flowering may follow winter rains of the northern climate if they should extend southward, or the summer showers from the tropics when they reach northward. Even as far south as Magdalena Bay this shifting of growing season is apparent, and my own visits there have shown me that in two successive years all the annuals and most of the perennials burst into life with the new year in consequence of the December rains, but during a following year, in January, hardly a flower could be seen, most of the bushes were leafless and the only signs of vegetable life to be found were remnants from the profusion that existed in October after a series of heavy tropical rains. The point at which the most decided change in the flora is seen occurs at about latitude twenty-eight degrees, in the vicinity of El Campo Aleman, and Calmalli, on the divide between the drainage sloping

southward into the San Ignacio Lagoon and that running northwest into the Pacific.

It has been shown in Zoe* that the flora of the Cape Region shows a greater affinity to that of Sonora than to that of Alta California and a preponderance of Mexican forms prevails as far north as Calmalli, where the vegetation, on account of the disappearance of southern plants and the accession of numerous northern ones, assumes a decidedly Californian aspect. Of course there is not as great a change as would be caused by the intervention of a high mountain range or a body of water, but at the lower and middle elevations the traveler from the south soon perceives a difference in the surrounding vegetation after crossing the low divide before reaching Calmalli.

East and west of this dividing region, higher and as yet unexplored mountains extend southward and doubtless carry along their summits many Californian plants to a lower degree of latitude, and the impossibility of drawing a line between the northern and southern floras is further shown by the fact of maritime species of the Pacific Coast extending their limits southward a greater distance than would be suspected, especially upon the islands, in the same manner as the more southern maritime flora is continued northward to those islands off the coast of Alta California.

There is another locality, equally important concerning the southern extension of Californian flora and especially interesting in that it must certainly be the most southern habitat of many plants. This interesting region is the high mountain known as San Pedro Martir, situated about one hundred and twenty-five miles southeast from San Diego, and much nearer to the Gulf of California than the Pacific Ocean. It is an extensive plateau rather than a mountain, having an elevation of seven or eight thousand feet and traversed by numerous rocky ridges reaching two or three thousand feet higher. It is the highest part of the elevated region extending southward from Campo and the Cuyamaca Mountains, which here culminates and falls away at the south to so low an elevation, that in crossing the Peninsula from

* Zoe iii, 223.

El Rosario to Calamujuet, no considerable range impedes the traveler.

The climate of San Pedro Martir is cold in winter; ice is formed on standing water even during the month of May, and like most elevated regions the rainfall is greater than on the neighboring lower lands.

The ridges traversing the plateau have a barren, desolate appearance, and the large rounded rocks with which they are covered form a striking feature of the landscape. Between these ridges little brooks arise and find their way at first through extensive green meadows, then run rapidly down the very steep mountain sides toward the Pacific Ocean. Trees of good size are found almost over the whole plateau and in some places are very abundant. *Pinus Jeffreyi* is the most common, but on the ridges a few sugar pines (*P. Lambertiana*) and along the streams some cedars (*Libocedrus*) keep them company. In a few localities some "quaking asp," "cypress" and silver fir can be found but they are not common, and at the lower elevations one of the piñon pines, *P. Parryana*, is almost the only tree. Oaks that never become large enough to be called trees are plentiful and form part of the underbrush that in many places, especially on ridges, is so thick as to be almost impenetrable; this chaparral is made up mainly of Manzanita and Ceanothus. Other bushes are scattered about and often in some localities they are abundant; the most noteworthy of these being: *Garrya Veatchii* at lower and *Garrya Wrightii* at higher elevations, *Rhamnus Californica* in almost every place and a willow common along the streams.

Our present knowledge of the vegetation of Northern Lower California has been mainly derived from several collections by Mr. C. R. Orcutt, who has traveled from its northern boundary as far south as El Rosario and San Fernando; and from the explorations of Dr. Edward Palmer about San Quentin and Lagoon Head. Mr. Orcutt has published a catalogue containing names of plants growing in Lower California, but no definite localities are given. The results of Dr. Edward Palmer's collecting have been published by the Department of Agriculture, and the California Academy of Sciences has printed in its Proceedings an account of the plants found on the trip between Magdalena

Bay and San Quintin. All plants mentioned in these publications as having been collected about San Quintin and farther south have been omitted from the following list. The writer made an excursion in May during the present year to San Pedro Martir, starting from San Diego, and the appended list contains names of plants collected at their most southern known habitat, and on this account is not a complete one of the flora of San Pedro Martir as it might seem from the frequency with which the name of this mountain appears:

Ranunculus aquatilis L. Common in and about the ponds of San Pedro Martir.

Ranunculus hydrocharoides Gray. Very abundant in the ponds of San Pedro Martir.

Aquilegia truncata F. & M. Common on San Pedro Martir.

Romneya Coulteri Harv. This is often seen along the valleys between Tia Juana and Colnett, and it is abundant on the hills about San Pedro Martir.

Dendromecon rigidum Benth. Along the edge of the plateau of San Pedro Martir.

Papaver Californicum Gray. On burned ground twenty miles south of Tia Juana.

Arabis Holbœllii Hornem. San Pedro Martir.

Vesicaria Fendleri Gray. San Pedro Martir.

Barbarea vulgaris R. Br. Common at the locality known as La Grulla, where it was probably introduced.

Cardamine paucisecta Benth. Cañon Salado.

Viola pedunculata T. & G. Colnett.

Arenaria alsinoides Willd. San Pedro Martir, perhaps its northern limit.

Calyptridium monandrum Nutt. Abundant from near Colnett to San Pedro Martir.

Montia fontana L. Very small plants growing amongst other vegetation in damp soil on San Pedro Martir.

Sidalcea malvæflora Gray. Growing in the wet meadows of San Pedro Martir.

Fremontia Californica Torr. A single specimen was found in the Salado Cañon near Colnett.

Linum perenne L. Common on San Pedro Martir.

Geranium cæspitosum James. San Pedro Martir.

Rhus ovata Watson. Common on San Pedro Martir.

Rhus integrifolia Nutt. This is usually a much branched shrub, but in some localities it becomes a tree having a diameter of more than a foot. It is known when large by the name mahogany.

Rhamnus Californica Esch. A very common bush on San Pedro Martir.

Ceanothus cordulatus Kellogg. A bush forming thickets six feet high. Flowers white and sometimes decidedly light purple in color. Highest elevations of San Pedro Martir.

Ceanothus Greggii Gray. Flowers white. San Pedro Martir.

Ceanothus Palmeri Trelease. Twigs green, leaves more or less dentate, flowers blue. The most beautiful species of Ceanothus on San Pedro Martir.

Ceanothus hirsutus Nutt. Slopes of San Pedro Martir.

LUPINUS PALLIDUS. Annual, a few inches in height, branching from the base, often spreading and forming tufts nearly a foot in diameter, densely strigose-pubescent and with some spreading hairs, leaflets five or six, spatulate, rounded at apex, 10-15 mm. long, usually much shorter than the petiole; stipules adnate for half their length: racemes short-peduncled, terminating the branches, capitate in flower, elongating but dense in fruit; bracts much shorter than the calyx: upper lip of calyx, 3 mm. long, deeply cleft into two divergent lobes; lower lip a third longer, oblong, very shortly three-toothed at apex; bracteoles none: corolla white without markings, about twice the length of the calyx; entirely glabrous; standard shorter than the wings and shortly cleft keel: ovary four-ovulate; pod pubescent, three or four seeded; seeds white marbled with black.

Sands in the dry bed of the creek near the Mission of San Vincente in northern Baja California, May, 1893.

Lupinus truncatus Nutt. Slopes of San Pedro Martir.

Hosackia grandiflora Benth. var. *anthylloides* Gray. San Pedro Martir.

Hosackia decumbens Benth. var. *Nevadensis* Watson. San Pedro Martir.

Hosackia crassifolia Benth. San Pedro Martir.

Psoralea orbicularis Lindl. Along streams among the foothills of San Pedro Martir.

Amorpha Californica Nutt. San Pedro Martir.

Amorpha fruticosa L. Guadaloupe Creek.

Astragalus circumdatus Greene. Common on San Pedro Martir. The growing plants are prostrate and the fruit lies upon the sand in which it usually grows. The green pods are fleshy after the fashion of *A. Caryocarpus* and the surrounding margin which is said to be "quite peculiar" and suggested the name of the species, appears only after drying.

Prunus emarginata Walpers. San Pedro Martir.

Rubus ursinus C. & S. Growing about the foothills of San Pedro Martir.

Fragaria Californica C. & S. San Pedro Martir.

Horkelia Californica Ch. & Schl. represented in northern central California by broader leaved forms which have received various names, as *Potentilla Kelloggii* Greene, *P. elata* Greene and *P. frondosa* Greene (which appears to be quite the same as *Horkelia grandis* H. & A. Bot. Beech. 339.) appears to diminish the size of its leaflets as it recedes from the seabord or goes southward. The southern and montane forms, *P. Parryi* Greene, *P. puberula* Greene, *P. Clevelandi* Greene and *P. Lindleyi* Greene (the latter substituted for *Horkelia cuneata* Ch. & Schl. on account of an earlier homonym, though there is an available synomym, *Horkelia Douglasiana* Nutt. Bot. Beech. 338.) reach on San Pedro Martir a leaf form almost as narrow as in typical Ivesia. There appears to be no character in the greater part of these proposed species to warrant their retention even as varieties. *P. multijuga* Lehm. is described without mention of the stamens, and including it in the synonymy of *Horkelia Californica* necessarily infers that the artist who made the drawing was mis-

taken not only in their number but in the character of the filaments.

Potentilla Wheeleri Watson. Growing on cliffs at dry, high elevations of San Pedro Martir. The plants are much larger than the original specimens and are very fragrant and somewhat glandular.

Potentilla glandulosa Lindl. San Pedro Martir.

Rosa Californica C. & S. San Pedro Martir.

Rosa minutifolia Engelm. Abundant near the coast from north of Ensenada to below El Rosario. It extends into the interior a dozen or more miles from the Pacific slope. In some localities most of the bushes produce white flowers.

Amelanchier alnifolia Nutt. San Pedro Martir.

Heteromeles arbutifolia Rœm. Growing along streams about the foothills of San Pedro Martir. This bush does not seem to have been found between here and the mountains of the Cape Region.

Heuchera rubescens Torr. San Pedro Martir.

Philadelphus serpyllifolius Gray. Common amongst rocks San Pedro Martir.

Ribes sanguineum Pursh. San Pedro Martir.

Œnothera biennis L. San Pedro Martir.

Megarrhiza Californica Torr. This is common at lower elevations and has been found far south of San Quentin. Specimens of variations in the shape and outline of the leaf were collected from one locality—they show all degrees of lobing between entire and divided nearly to the centre. This leaf variation is common in western species of Echinocystis and characters based on forms of the leaf evidently have no value.

Datisca glomerata B. & H. San Pedro Martir.

Cereus phœniceus Engelm. grows on San Pedro Martir and has been found as far south as Comondu.

Cereus gummosus Engelm. reaches to north of Ensenada, but the plants are dwarfed.

Selinum capitellatum B. & H. Common on San Pedro Martir.

Velæa arguta (T. & G.) San Pedro Martir.

Hydrocotyle ranunculoides L. San Pedro Martir.

Garrya Wrightii Torr. San Pedro Martir. Also found in the Cape Region Mountains.

Garrya Veatchii Kell. San Pedro Martir; the type was from Cerros Island.

Symphoricarpos mollis Nutt. San Pedro Martir.

Sambucus glauca Nutt. Not common on San Pedro Martir.

Lonicera hispidula Dougl. var. Common on San Pedro Martir.

Brickellia Californica Gray. San Pedro Martir.

Aplopappus linearifolius DC. Foothills of San Pedro Martir.

Chrysopsis sp. San Pedro Martir.

Erigeron concinnus T. & G. San Pedro Martir.

Erigeron flagellaris Gray. San Pedro Martir, a low form with rongh pubescence.

Antenaria dioica Gærtn. San Pedro Martir.

Franseria chenopodiifolia Benth. From Magdalena Bay to north of Ensenada.

Franseria bipinnatifida Nutt. Sea beach at Colnett.

Franseria camphorata Greene. Mesas about Vallederos.

Helianthus Californicus DC. Very abundant on San Pedro Martir and San Telmo Creek.

Leptosyne maritima Gray. Nearly to Cape Colnett.

Madia valida. Perennial, suffrutescent, branching, two or three feet high, rather sparsely covered and the leaves margined with stipitate glands, the peduncular end of the branches long-hairy, leafy nearly to the top; leaves alternate, somewhat rigid linear-lanceolate, 2-4 cm. long, 4 mm. wide: heads 2 cm. long, rather narrow, outer bracts rather few (8-10) long, and narrow; completely enwrapping the akene, the lanceolate tips spreading, inner bracts about as many united into a cup: rays 15-18 cm. long, broadly linear, bright yellow; akenes of the ray without pappus, glabrous, strongly compressed, striate, slightly falcate-

oblique; disk akenes numerous apparently fertile, striate, nearly glabrous with a pappus of 15-20 stout paleaceous awns 10 mm. long, plumose to the base, equaling the disk flowers and about a third longer than the akenes.

San Antonio, Lower California, on the road between Tia Juana and Ensenada, June 4, 1893. The plant looks much like some of the more glabrous forms of *Aplopappus linearifolius*.

Hemizonia Parryi Greene. This plant was collected near Cañon Salado with stems of the preceding year remaining attached to the root, showing that it may become perennial.

Hulsea Californica T. & G. Very common on San Pedro Martir. It is much less floccose-woolly than the form from Alta California.

Chænactis Parishii Gray. Common on San Pedro Martir.

Artemisia tridentata Nutt. San Pedro Martir and San Telmo Creek.

Senecio Lemmoni Gray. Vallederos Creek.

Senecio Californicus DC. Colnett.

Cnicus Drummondii var. *acaulescens* Gray. Common about the wet meadows of San Pedro Martir.

Cnicus Californicus Gray. San Pedro Martir.

Hieracium Brandegei Greene. San Pedro Martir. Agrees with the typical specimen excepting that the pappus is longer.

Taraxacum sp. San Pedro Martir; perhaps introduced.

Arctostaphylos Pringlei Parry. San Pedro Martir. Blooming later and more viscous, with redder bracts and flowers than the other species.

Arctostaphylos glauca Lindl. San Pedro Martir. Very abundant.

Sarcodes sanguinea Torr. Not uncommon on San Pedro Martir.

Frasera albomarginata Watson. San Pedro Martir.

Frasera Parryi Torr. San Pedro Martir.

Gilia bella Gray. San Pedro Martir.

Gilia inconspicua Dougl. San Pedro Martir.

Gilia floccosa Gray. Slopes of San Pedro Martir.

Gilia atractyloides Steud. San Telmo.

Phacelia circinata Jacq. San Pedro Martir.

Nama Parryi Gray. San Pedro Martir.

Eriodictyon angustifolium Nutt. San Pedro Martir.

Eriodictyon sessilifolium Greene. is common in many places in the northern peninsula. Mr. Greene was mistaken in crediting it to Alta California, for Mr. J. M. Hutchings, the earliest recorded collector, states that the label quoted * by Mr. Greene is an error and that the specimen was collected between Ensenada and Tia Juana.

Convolvulus occidentalis Choisy. Slopes of San Pedro Martir.

Solanum Xanti Gray. San Pedro Martir.

Aphyllon fasciculatum Torr. San Pedro Martir.

Pentstemon centranthifolius Benth. San Pedro Martir.

Antirrhinum Nuttallianum Benth. San Pedro Martir.

Cordylanthus Kingii Watson. San Pedro Martir.

Mimulus Palmeri Gray. Very abundant on San Pedro Martir.

Mimulus Fremonti Gray. Hills at foot of San Pedro Martir

Mimulus brevipes Benth. Near Vallederos.

Mimulus cardinalis Dougl. San Pedro Martir.

Limosella aquatica L. San Pedro Martir.

Monardella linoides Gray. San Pedro Martir.

Acanthomintha ilicifolia Gray. Hills about San Telmo.

Audibertia incana Benth. var. *pachystachya* Gray. San Pedro Martir.

Stachys ajugoides Benth. San Pedro Martir.

Brunella vulgaris L. San Pedro Martir. This appears again in the Cape Region Mountains.

Monarda macrantha var. *tenuiflora* Gray. San Pedro Martir.

Rumex salicifolius Weinm. San Pedro Martir.

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* Bull. Cal. Acad. i, 201.

Polygonum amphibium L. San Pedro Martir.

Eriogonum Wrightii Torr. San Pedro Martir.

Platanus racemosa Nutt. Slopes of San Pedro Martir.

Phoradendron juniperinum var. *Libocedri* Engelm. Growing on *Libocedrus decurrens*.

Phoradendron Bolleanum Eichl. Growing on *Cupressus Guadalupensis*.

Arceuthobium occidentale Engelm. On *P. ponderosa*.

Euphorbia Palmeri Engelm. San Pedro Martir. The specimens show the gland erose rather than crenate. It is common and usually yellow with a conspicuous Æcidium.

Populus tremuloides Michx. San Pedro Martir. Found growing in several places.

Quercus agrifolia Née. Base of San Pedro Martir, Santa Cruz Creek. Very large trees.

Quercus Wislizeni A. DC. San Pedro Martir, in the form of large bushes.

Quercus chrysolepis Liebm. Common on San Pedro Martir.

Quercus grisea Liebm. Very abundant on the higher elevations of San Pedro Martir.

Quercus dumosa Nutt. Hills near San Telmo.

Sisyrinchium bellum Wats. San Pedro Martir.

Smilacina stellata Desf. San Pedro Martir.

Juncus triformis var. *uniflorus* Engelm. San Pedro Martir. Sometimes so abundant as to redden moist ground. The specimens are all dimerous and even smaller than those noted by Dr. Engelmann.

Epicampes rigens Benth. San Pedro Martir.

Elymus Sitanion Schult. San Pedro Martir.

Juniperus Californica Carr. This large bush or small tree is common on the hills about the base of San Pedro Martir and has been collected much farther south.

Cupressus Guadalupensis Watson. San Pedro Martir. Seen in but one locality.

Abies concolor Lindl. San Pedro Martir. Very few trees seen.

Pinus Lambertiana Dougl. San Pedro Martir. Not abundant.

Pinus Parryana Engelm. Common at the lower elevations of San Pedro Martir.

Pinus ponderosa Dougl. var. *Jeffreyi* Engelm. San Pedro Martir. The most abundant tree of the plateau.

Libocedrus decurrens Torr. San Pedro Martir. Not common.

Polypodium vulgare L. San Pedro Martir.

Pellæa Ornithopus Hook. San Pedro Martir.

Asplenium septentrionale Hoffm. San Pedro Martir.

Woodsia Oregana Eaton. San Pedro Martir.

Woodwardia radicans Smith. San Pedro Martir.

PERITYLE ROTUNDIFOLIA (Benth.) *Amauria rotundifolia* Benth. Bot. Sulph. 31; *Perityle Fitchii* Torr. Pac. R. Rep. iv, 100; *Laphamia peninsularis* Greene Bull. Cal. Acad. i, 8. Through the courtesy of Mr. W. Botting Hemsley of the Kew Herbarium, who has very kindly furnished us a few akenes of the type, the longdoubtful genus Amauria disappears at last from our flora. Exploration of the Peninsula of Baja California has in recent years been prosecuted to so considerable an extent, that the existence at a place so well known as San Quintin of a generic type not found by subsequent botanical visitors had become improbable, and attention was called to its possible identity with some known plant. It has not, so far, been found north of San Quintin.

The shape of the akenes, rendering it a somewhat aberrant Perityle, is responsible for the circumstance of its having been named in three different genera. The specific name *rotundifolia* is much the earliest, indeed Perityle has over Amauria precedence rather than priority. Like most of the other species the flowers of *P. rotundifolia* seem to be largely unfertilized, the akenes of the greater number being white and inane.

T. S. B.

FLORA OF BOULDIN ISLAND.

BY KATHARINE BRANDEGEE.

In the centre of the great valley of California, where all its waters meet at what was once the deepest part of the immense lake contained by the encircling rim of mountains, there is a large area embracing many hundreds of square miles which is but little above the level of the sea. This meeting of the waters is a labyrinth of tortuous channels embracing green islands of all sizes, from the islet of a few rods, not yet firmly anchored and rising and falling with the tide, to such bodies of land as Grand and Sherman Islands many miles in length and breadth. Through the winding channels the river steamers and fishing sloops pick their way with ease, though the traveler, seeing them for the first time, becomes completely bewildered. The islands are all of the same formation, a pure and exceedingly fine vegetable mold arising from the decay of countless generations of "Tule" and without trace of sand or gravel. They are all either entirely or in great part below the level of the water, and in order to be habitable must have strong levees watched and maintained with sedulous care. The unleveed islands often have cattle pastured upon them, even in cases where the sod is so thin that the animals spend a considerable part of their time scrambling out of the ooze, into which the breaking of the crust has let them fall. The vegetation, however, though of a lush and vivid green, is coarse, and cattle do not at first thrive very well upon it.

Of those enclosed by levees and in cultivation, Bouldin Island is a good example and is of more interest to botanists than any of the others, for upon it, in the autumn of 1872, Mr. C. D. Gibbes collected the plants described by Dr. Kellogg in the Proceedings of the California Academy of Sciences under the names of *Hibiscus Californicus*, *Erigeron discoidea*, *Solidago elongata* var. *microcephala*, *Helianthus giganteus* var. *insulus* and *Hedeoma purpurea*. The island has an area of about a dozen square miles and is owned by four men, who lease the lands on shares to Italians, Portuguese and Chinese. It is surrounded by the Mokelumne River and its sloughs. The levee is built of clay dredged from

the bottom of the river, and is added to year by year, as it is constantly sinking. Both sides of the levee are fringed with a dense growth of willows, alder, and the ever present "Tule." The land slopes to the centre and is irrigated by means of guarded openings in the levee, care being taken not to admit an undue quantity of water. The island is dry on the surface for the most part, although the water is but a short distance beneath, and the winds often raise the light loam from the roads in swirling clouds of dust. The ground shakes very perceptibly from the passing of wagons, and in many places even from a footstep, a peculiarity which is somewhat unpleasant until custom has rendered it familiar.

The natural flora of the islands embraces but few species as would naturally be expected from the sameness of environment. It consists besides the prevailing "tules"—*Scirpus lacustris* and *S. Tatora*—in great part of *Psoralea macrostachya*, *Epilobium holosericeum*, *Solidago occidentalis* and *S. elongata*, *Baccharis Douglasii*, *Helianthus Californicus*, *Artemisia vulgaris*, *Apocynum cannabinum*, *Convolvulus Sepium*, *Stachys albens*, *Polygonum Hartwrightii*, *Urtica holosericea*, *Alnus viridis*, *Salix longifolia* & *S. sessilifolia*, *Typha latifolia*, *Cyperus erythrorhizos*, *Phragmites communis*, etc. The leveed islands abound in weeds as may be seen from the list appended. Their luxuriance in most cases far exceeds anything seen on the mainland, and the species are usually well diffused. The vegetation is late, the time of fullest flowering being in August and September.

The entire absence of many of the large genera and even families of Californian plants of the not distant mainland is very noticeable. *Ranunculus aquatilis* is the only plant belonging to that family to be expected, and even that has not been collected on Bouldin Island. There are no Caryophyllaceæ except a stray *Silene Gallica* or *Stellaria media*, no violets, no Saxifragaceæ, no Hydrophyllaceæ, no Polemoniaceæ except an occasional recently immigrated *Gilia squarrosa*, not a single Hemizonia or Eriogonum, and no plant belonging to the Orchidaceæ, Iridaceæ, or Liliaceæ, unless *Lilium pardalinum* should be found to occur in some places.

The list below is the result of a visit to Bouldin Island, Sep-

tember 6 and 7, 1892, and of a single day early in July of the present year. An inspection of other islands would undoubtedly add other introduced plants not yet known to our flora. It is not intended to be complete even for the flowering plants and ferns, but is approximately so. Those which are credited to our flora for the first time are marked *. There remain as yet unidentified several which are plainly not native.

Brasenia peltata Pursh. The Slough in the centre of the island.

Nuphar polysepalum Engelm. The same locality.

Sisymbrium officinale Scop.

Nasturtium curvisiliqua Nutt.

Capsella Bursa-Pastoris L.

Silene Gallica L.

Stellaria media L.

Portulaca oleracea L.

**Hypericum mutilum* L.

Hibiscus lasiocarpus Cav., *H. Californicus* Kell. About the banks of levees and sloughs. There seems to be no reason to consider it indigenous.

Malva parviflora L.

Trifolium repens L. Very common. *T. pratense* is one of the staple crops.

Melilotus parviflora Desf.

Medicago sativa L.

Hosackia subpinnata T. & G.

Psoralea macrostachya DC.

Lathyrus venosus var. *Californicus* Wats.

Rosa Californica Ch. & Schl.

Rubus ursinus Ch. & Schl.

Potentilla rivalis Nutt.

Lythrum albicaulis Bert., *L. Sanfordi* Greene.

Jussiæa repens L.

Epilobium holosericeum Barb.

Epilobium Franciscanum Barb.

Epilobium paniculatum Nutt.

Œnothera biennis L.

Hydrocotyle prolifera Kell. Very abundant and fruiting in great profusion.

Apium graveolens L. Not common as it is about the borders of the Suisun Marsh.

Œnanthe sarmentosa Nutt.

Cicuta Bolanderi Wats. Often ten feet high or more.

Cephalanthus occidentalis L.

Galium trifidum L.

Solidago elongata Nutt. Six to nine feet high with a pyramidal panicle one to two feet long and half as broad.

Solidago occidentalis Nutt. Of great size and luxuriance—perhaps the most abundant composite of the island.

Aster Douglasii Lindl.

Conyza Coulteri Gray, *Erigeron discoidea* Kell. Frequent but not abundant.

Baccharis Douglasii DC.

Pluchea camphorata DC.

Gnaphalium palustre Nutt.

Ambrosia psilostachya DC.

Xanthium strumarium L. Abundant, probably brought in by sheep which are ferried from the mainland to the stubble fields in September.

Xanthium spinosum L. Less abundant than the last.

Helianthus Californicus DC. *H. giganteus* var. *insulus* Kell. Ten to fifteen feet high.

Bidens chrysanthemoides Michx. Common about the ditches.

**Bidens frondosa* L. Very abundant about the roadsides.

Matricaria discoidea DC.

Artemisia vulgaris L.

Senecio vulgaris L.

**Cnicus lanceolatus* Hoffm. Abundant and the only thistle observed on the island.

Centaurea Melitensis L.

Lactuca scariola L. Becoming common about the landings and roadsides.

Anagallis arvensis L.

Apocynum cannabinum L.

Asclepias Mexicana Cav. Infrequent.

Heliotropium Curassavicum L.

Convolvulus arvensis L. Abundant.

Convolvulus Sepium L. Common about the levees and banks of sloughs and about the marshy borders of the Sacramento and San Joaquin Rivers. The early flowers appear to hardly ever set their seeds.

Cuscuta arvensis Beyr. Abundant.

Solanum nigrum L.

Scrophularia Californica Cham.

Mimulus luteus L.

Veronica Americana Schwein.

Utricularia vulgaris L. Central Slough near the schoolhouse in company with *Brasenia peltata*, etc.

**Mentha pulegioides* L. Occasional, occurring also near the county road at Paradise Cut about four miles from Lathrop.

Hedeoma purpurea Kell. changed by Dr. Gray in Bot. Cal. to *Micromeria purpurea*, proves to be *Mentha Canadensis* L. Dr. Kellogg's type is at Harvard. It is one of the rank abundant plants of the island.

Lycopus sinuatus Ell. In several forms.

Lycopus lucidus var. *Americanus* Gray.

Nepeta Glechoma Benth.

Scutellaria galericulata L.

**Scutellaria lateriflora* L.

Stachys ajugoides Benth.

Marrubium vulgare L.

Stachys albens Gray. Abundant and often very tall.

Lippia lanceolata Michx.

Verbena hastata L. Very abundant and tall—five to eight feet high.

Plantago major L.

Plantago lanceolata L.

Rumex maritimus L.

Rumex conglomeratus Murray.

Rumex crispus L.

Rumex obtusifolius L.

Polygonum amphibium L.

Polygonum Hartwrightii Gray. Extremely abundant and of rank growth.

Polygonum punctatum Ell.

Polygonum lapathifolium L. Very abundant.

Polygonum aviculare L. Common.

Polygonum Convolvulus L.

Amarantus albus L.

Amarantus retroflexus L.

**Amarantus chlorostachys* Willd.

Amarantus. Not yet determined.

Chenopodium ambrosioides L.

Chenopodium album L.

Urtica holosericea Nutt.

Alnus incana Willd. var. *virescens* Wats. About the levees and along the overflowed margins of the streams as far down as Antioch.

Salix longifolia Muhl.

Salix sessilifolia Nutt. var. *Hindsiana* Anders. The two common willows of the islands. In September, on Bouldin Island, they, as well as all the other trees, are half covered and disfigured by the great webs of a tent caterpillar *Hyphantria textor*.

Populus Fremonti Watson. Not common.

Asparagus officinalis L. A considerable part of the acreage of Bouldin Island is devoted to the cultivation of this plant. It is becoming abundantly naturalized, as might be expected from the profusion of seed.

Typha latifolia L.

Lemna trisulca L.

Lemna minor L.

**Speirodela polyrrhiza* (L).

Alisma Plantago L.

Sagittaria sagittæfolia L. var., *S. Sinensis* Sims. The Chinese plant this for its edible tubers, and it has escaped and is thoroughly at home in nearly all the marshy lands of the Sacramento and San Joaquin. It ripens a very large number of seeds, which are widely disseminated by the waters.

Juncus effusus L.

Juncus xiphoides Meyer.

Cyperus erythrorhizos Muhl.

Scirpus lacustris L.

Scirpus Tatora Kunth.

Scirpus Olneyi Gray.

Eleocharis palustris R. Br.

Carex. Not determined.

Panicum Crus-galli L. The most common grass.

Setaria glauca Beauv.

Phleum pratense L.

Phalaris Canariensis L.

Polypogon Monspeliensis Desf.

Agrostis alba L.

Agrostis scabra Willd.

Agrostis verticillata Vill.

Holcus lanatus L.

Phragmites communis Trin.

Lolium perenne L.

Hordeum murinum L.

Equisetum arvense L. Abundant on the clay of the levee.

Woodwardia radicans Smith.

Asplenium Filix-foemina Bernh.

Aspidium rigidum var. *argutum* Eaton. Ferns were observed only about the levee.

Mosses, Liverworts and Lichens are conspicuous only by their absence, but fungi — parasitic on living plants — abound.

THE SPECIES OF AMBLYCHILA.

[With Plates xxviii, xxix.]

BY J. J. RIVERS.

Are there three species of Amblychila, or two, or only one? Having before me the three forms that have received names, and having also Say's and Reiche's descriptions and also Thomson's "Monographie des Cicindelides" together with my description of *Am. Baroni*, I am well prepared as far as material is concerned to give a resumé of the luckless paths into which *Amblychila cylindriformis* Say, *A. Picolominii* Reiche, and *A. Baroni* Rivers have been made to travel.

In 1823 Say published his description of *A. cylindriformis;* in 1839 another form which belonged to the Dupont collection was described and figured under the name of *A. Picolominii* Reiche. This insect was said to have been found near the bay and port of San Francisco, California, in latitude forty-eight degrees north. The locality is considered altogether an erroneous citation, as San Francisco, Cala. is in thirty-seven degrees, forty-seven. The difficulty in the way of coming to an agreement in the identification of these insects is the fact that both our most learned coleopterists have pronounced Dupont's examples to be *A. cylindriformis* of Say, while Reiche and Chaudoir consider them or some of them as a distinct species.

There appears much confusion concerning the identity of *A. Picolominii.* Thomson's monograph gives a copy of the

description and a figure from Dupont and Reiche, but calls it *A. cylindriformis* of Say, though neither the description nor the figure agrees with it. I fear that the author of the "Monographie des Cicindelides" must have been influenced by reading the opinions of our two great coleopterists and copied the description and the figure of Dupont and Reiche without review. Look at the figure on plate 3, fig. 3 in Thomson's Monograph and guess what induced the author to call it *A. cylindriformis* Say. The two species are abundantly distinct and I feel certain that such eminent men as Le Conte and Horn have not been shown the insect that furnished the figure illustrated in Thomson's Monograph. Dr. Horn recently wrote me that the French coleopterists considered my *A. Baroni* as a small example of *A. Picolominii.* I had already begun to be of that opinion, and after further consideration I must own that the French opinion is the correct one. I hold that there are two species, viz.: *Amblychila cylindriformis* Say * and *Amblychila Picolominii* Dupont Collection, Pl. 19 fig. 1 à 6 and Reiche † and that *Amblychila Baroni* Rivers is the male of *A. Picolominii.*

It appears to be an impossibility for anyone to write a correct history of *Amblychila* and formulate a reliable description, or at least one that will meet with the approval of the coleopterological fraternity. The description by Say is rather terse, there being an omission of the very coarse and distinct punctuation of the apex of the elytræ. Reiche seems to have done some bad work also, for his *Picolominii* is said to have these coarse puncturings on the apex of elytra, showing that he must have had both species under examination, for the examples from Arizona are impunctate at the apex of the elytra. Reiche says: "*de gros points irregulièrement placés à la base et à l'extrémité des élytres.*" The third form, which I recently received from Peach Springs, Northwestern Arizona, and which I take to be Reiche's *Picolominii* and the species named *Baroni* from Southern Arizona, both have elytral apices free from points or punctures. So that Dr. Horn and others must have some other reasons for

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* Trans. Amer. Ent. Soc. Vol. x Proceed. p. iv.

† Annales S c. Ent. de France p. 557, 1839.

considering the Dupont specimens as those of the Texan form of *cylindriformis.* But what are we to do with the great bulk of the description by Reiche, which does not fit *cylindriformis* Say; and what with the figure in Thomson, which is a good portrait of my recent addition from Arizona? In the description of *A. Baroni* a glaring mistake was made in sex, calling the example a female when it should have been recorded as a male, as a subsequent examination proved it to be.

Say's description may be taken as fairly good. His application of the name is also good, as it would be applicable. The form is subcylindric or subquadrate, but neither of these terms would be appropriate to either of the other species or forms, because they are wider than deep, and altogether flatter insects.

DESCRIPTION: Form gracefully elongate-oval. Above wholly shining black with high polish. Beneath also shining black. Head subquadrate; clypeus with the usual marginal punctures; behind the clypeal suture are two punctures widely separated; behind the second or frontal suture are two punctures as in *A. Baroni* but there are about ten or twelve other punctures differing both in number and position from those seen in *Baroni*. Thorax strongly convex; longer than wide as observed from above; broad across the front and produced in the middle; much narrowed behind; from the front angles runs a well defined raised continuous marginal line which extends along the lateral and basal margins; an uneven longitudinal central impressed line begins infirmly on the basal margin and ceases about where the arcuate impressed line crosses the fore part of the disc. Elytra twice as long as wide; much flattened on the central area; two-thirds from sutural line arises a well-defined carina, it is high and sharp, beginning at the base and ending abruptly one-fourth from the apex. A raised line just as bold as the carina runs nearly parallel to it, but beginning a little short of the base and ending firmly and nearer the apex than does the carina, this line is punctured at wide intervals and becomes slightly serrate at the base. Another raised line, which might be termed the acute margin, begins on the basal angle but does not reach so near to the apex as the other line or the carina; this line is strongly mucronate and at the basal angle it becomes

strongly serrate. The central area forming the disc inside the carinæ has at the base on each side of the suture four broken rows of muricate punctures, which are reduced to two rows at the middle, then reduced to one row and entirely obsolete before reaching the apex. In the space between the carina and the first raised line are alternate rows of muricate punctures, beginning at the base with two and increasing to four rows apically, but all becoming obsolete on the apex. Between the first and second line, the space is occupied by two or three rows of muricate punctures; between the second line and the real margin are from two to four rows of the same kind of punctures as before mentioned, but on the epipleural portion near the apex are some minute punctures without points, spines, or mucrons or bristles, but all the other punctures carry a bristle or stiff hair.

The reasons for considering this species *Picolominii* Reiche are numerous. It agrees in the main with the descriptions by Reiche and Thomson and also with the latter's figure though by some oversight he calls it *cylindriformis* Say, while it is a good portrait of the insect described above. Reiche says: "The only specimen I ever saw was a female." Now what has become of that insect or where is the specimen that furnished Thomson with his figure? The reasons for considering *Baroni* as the male of *Picolominii* are: It is of the same color, has the same kind of puncturing, and is wanting only in carina and complete raised lines; these, however, can be traced by close analysis. At the base of the elytra in *Baroni* the beginnings of raised lines are visible and the method of their formation is plainly discernible. The spines on the front margin of the punctures being depressed and fused into a continuous line by contact with their nearest neighbors, the keel formation begins. This is easily traced in *Baroni* but it being the male form there is not the same necessity for keels and carinæ as there is in the female, of which sex *Picolominii* seems to be. *Cylindriformis* Say has little relation as a species to *Baroni* or *Picolominii*; the coloring and the style of ornamentation differ. In the former species the elytra are usually brownish, but in the latter black is the color. In the former two kinds of punctural markings are always present while in the latter there is but one uniform style.

Cylindriformis Say (not of Thomson) is closely punctured all over the elytra with large and small punctures on a rugulose ground. *Picolominii* and *Baroni* have but few punctures, far apart on a smooth ground and flat surface. The number of punctures in each species should be noticed: in *cylindriformis* there are about 230—240 on the central or sutural line and near the suture there are about 40. In *Picolominii* the whole number in the same area does not number over 40, while near the suture there are but three or four. On the deflexed portion of the elytra and covering the apex, large punctures occupy all available space. On the same part in the other species the apices are smooth.

Cylindriformis.	*Picolominii.*
Length, 30 m.m.; color, brownish; surface of elytra rugulose and irregularly punctate; apex of elytra very coarsely punctured.	Length, 25 m.m.; color, deep black; surface of elytra smooth and regularly punctate; apex of elytra with punctures scarcely visible.

Locality Peach Springs, Truxton Valley, N. W. Arizona. Altitude, 5000 feet.

Peach Springs is about sixty miles from the nearest boundary line of Nevada, and about eighty miles from the Californian state line. The regions traversed by the Colorado of the west and its western tributaries seem to be the habitat of *Picolominii*. The original statement that it was found near the Port and Bay of San Francisco, in New California, is presumably a mistake. The confusion may have arisen from copying from the ship's log, which gave the final clearing from the western coast as the port above cited. But I think that Picolomini went up the Bay or Gulf of California, and then followed the course of the Colorado and Gila Rivers. What suggests such a course is the fact that *Baroni* was found on the Gila and the *Picolominii* on the Colorado, and possibly Picolomini took his example a ♀ in the San Francisco Mountains.

The original description of *A. Picolominii* is appended.

AMBLYCHILA PICOLOMINII Dupont Collection. (Voyez Pl. 19, fig. 1 à 6.)

Longueur 28 millim. largeur, 9 millim.

Ater, nitidus; capite lævigato; thorace subquadrato, lævigato subcanaliculato; elytris obsolete punctulatis, lineis tribus elevatis; interstitiis, puncte profunde impressis.

FŒMINA. Corps entièrement d'un noir brillant, poli.

Tête, lisse; deux enfoncements larges peu marqués, entre les yeux; deux points enfoncés au-dessus de chaque orbite.

Epistome, lisse; un gros point enfoncé de chaque côté.

Labre, lisse; de gros points enfoncés le long de sa marge; ces points, comme ceux des orbites et de l'épistome, servant d'insertions à des poils raides.

Antennes avec quelques poils rares; leur quatre premiers articles d' un brun noirâtre; les autres obscurs, pubescents.

Palpes, d'un brun noirâtre, avec l'extrémité de chaque article un peu clair.

Corselet aussi long que large, avec quelques rides transverses très fines; deux impressions anterieures, arquées, parallèles, obsolètes, et une autre droite, encore moins marquée le long du bord postérieur.

Elytres, presque le double plus large que la base du corselet, ovales, allongées, couverts de très petits points enfoncés presque effacés; carène effacée à son extrémité, n'atteignant que les *cinq sixièmes de la longueur de l'élytre;* une ligne élevée, aiguë, aux deux tiers du disque de l'élytre, vers la carène; une autre au tiers de l'épipleure, toutes deux plus courtes que la carène; une première série longitudinale de gros points enfoncés sur la disque, allant jusqu' à l'extrémité de l'élytre; une seconde semblable dans l'intervalle de la première ligne élevée et de la carène, et une troisième dans l'intervalle de la carène et de la seconde ligne élevée: celle-ci, comme la carène, crénelée par des points enfoncés très serrés; de gros points irregulièrement placés à la base et à l'extrémite des élytres, et les épipleures couvertes de points semblables plus rapprochés; la plupart de ces points, précédés d'un petit point élevé, servant d'insertion à un poil raide. En dessous les segments de l'abdomen lisses, avec quelques gros points enfoncés de chaque côté.

Pattes couvertes de poils noirâtres.

Le seul individu que j'aie vu de cette espèce est une femelle: M. Dupont l'a dédié à M. Picolomini, qui l'a trouvé au port ou baie de Saint Francisco, dans la Nouvelle-Californie [sic] sous le 48e degré environ de latitude septentrionale.—*Annales de la Soc. Entom. de France, Tome 8, 1839 p. 560–561.*

GENERAL BIRD NOTES.

EDITED BY WALTER E. BRYANT.

LECONTE'S THRASHER (*Harporhynchus lecontei*) WEST OF THE SIERRA NEVADA.

On March 10 of this year I was at Onyx, just above the junction of the north and south forks of the Kern River, in a valley characterized by desert vegetation—cholla, sage and Spanish

dagger. While collecting through this growth, I heard the very well-known notes of Leconte's thrasher and found the author; but as is generally the case with this species, a bird seen is by no means in the cabinet. After chasing him for several minutes I got a long-range snap-shot, but lost him. Later I heard one or more others, but they could not be secured.

A. W. ANTHONY.

[In North American Fauna No. 7, Part II, Leconte's thrasher is recorded from the San Joaquin Valley, near Buena Vista Lake, upon the observations of Mr. Nelson. The maps which are published show that the distribution of the creosote bush (*Larrea tridentata*) and the northern distribution of Leconte's thrasher are almost ex ctly co-extensive.—W. E. B.]

VAUX'S SWIFT AT REDWOOD CITY.

On June 25, 1893, Mr. C. Littlejohn of Redwood City collected a pair of these birds which had been seen about the town on several occasions, probably the same individuals, as none have been seen since that date. The first appearance of the species was in the fall of the previous year, when two or three were seen. In reply to a letter of mine, Mr. Littlejohn writes: "I too thought the swifts had been living in a chimney, and as I had never seen a chimney swift I thought these might be a pair of them that had found their way out to California. When they were taken they had a strong smoky smell, which they still retain in a less degree. I think the odor was too strong to come from any charred tree, as you suggested, and it reminded me strongly of the smell of an Aleut's hut in Alaska. The female was probably not nesting at the time."

Vaux's swift is an irregular summer resident of Sebastopol according to Mr. F. H. Holmes.

W. E. BRYANT.

NOTE ON THE NESTING OF SAMUEL'S SONG SPARROW.

At Redwood City as at Haywards, Samuel's song sparrow is confined during the breeding season to the salt marsh, where it begins nesting early in March and has its young reared before the high tides in the latter part of May or first of June would interfere. This season I found them with young in the latter part of June in the woods and at the base of the mountains

about five miles from the marsh, which led me to believe that there, in limited numbers at least, they reared a second brood which they ordinarily could not do on the marsh for the reason mentioned above. C. LITTLEJOHN.

MONGOLIAN PHEASANTS OF OREGON.

The birds (*Pasianus torquatus?*) were introduced into the country by Hon. O. N. Denny, U. S. Consul-General at Shanghai, China, in 1882. There were something less than sixty birds, and they were turned out on an island in the Willamette River, but have since been scattered around in different localities. Mr. Denny also introduced the Golden Pheasant (*Chrysolophus pictus*) which I think have died out. An act to protect them was passed on October 24, 1882, and has since been renewed and is still in force, although almost a dead letter now.

The pheasants thrive best in the southern counties. They are not more destructive to crops than any other game birds.

BERNARD J. BRETHERTON.

A MIGRATION OF BONAPARTE'S GULL.

On May 11, 1889, I observed several flocks of Bonaparte's gull (*Larus philadelphia*) flying down this (Pajaro) valley, westward toward the ocean, and they flew every night till the first of June. They commenced flying about seven o'clock, if foggy, or half-past seven if clear, and would fly till dark. The flocks had from five to fifty or more birds in each. Some nights flock after flock would go by and then again four or five flocks would be all I could count in an evening. The first flocks seemed to be old birds with black heads, and a few days later all the birds shot were in young or winter plumage. The stomach of one of the birds which I shot contained a piece of gravel and what looked like parts of black insects. Later I examined another which was full of whitish worms about three-fourths of an inch long and as large as a number fourteen wire.

I do not know why the birds should come down this valley or where they came from, but suppose they were migrating and had come from the San Joaquin River. J. R. CHALKER.

WILSON'S PHALAROPE BREEDING IN CALIFORNIA.

Yesterday [June 16, 1889] I was at the south end of Lake Tahoe and waded the swamp. I found a phalarope's nest but the eggs were hatching. An egg which was pipped looked almost exactly like a spotted sandpiper's egg—I could not have told the difference. The young, which were two in number, were quite dark buff with a black stripe from the top of the head to the tail, a small black stripe where the tail should be, three black dots on each side of the body and a black dot on each wing and side of head. The legs must have been two inches long and the feet nearly an inch, the latter as near as I can remember were of a lead color; the bill was about half an inch long. The old ones came quite close to me, flying about and uttering that peculiar quack of theirs. WALTER D. BLISS.

THE BOHEMIAN WAXWING IN CALIFORNIA.

The only record of the occurrence of the Bohemian waxwing (*Ampelis garrulus*) in this State, I believe, is that of a straggler taken by Dr. Cooper at Fort Mohave on January 10, about twenty-three years ago. The bird is probably only a winter visitant and the lack of winter observations in the high Sierra accounts for it not being better known.

The Academy of Sciences has six specimens which were sent in the flesh from Susanville by Mr. T. B. Sanders. Two were collected on February 2, 1892, and the other four on February 17. W. E. BRYANT.

A MESQUITE TINEID WHICH CONSTRUCTS A BAG-LIKE CASE FROM THE LEAVES.

BY C. H. TYLER TOWNSEND.

On May 15, 1891, I found two case-worms on mesquite (*Prosopis juliflora*), on the mesa to the east of Las Cruces, New Mexico. The larger case measured over 20 mm. in length. On May 31, 1891, the mesquite bushes on the mesa, for a mile to the east of town, were well stocked with the cases of this larva, the majority of the bushes having numbers on them. On May 13, 1892, they were again observed to be very plentiful on the mesquite in the same locality. A moderately small and rather

slender black and yellow hornet was found on this date pulling one of the larvæ out of its case.

The cases of this species are constructed of little leaflets of the mesquite, fastened together longitudinally with silk into an irregular, more or less tubular bag-like case, so as to protect the larva inside. The leaflets which compose the case are always more or less eaten along the midrib, but not entirely through. The cases bear considerable resemblance to those of *Psyche confederata*. Hanging perpendicularly from the leaves while the larvæ are feeding, they give the mesquite bushes the appearance of being hung with miniature bag-worms.

Some of the larvæ in their cases were sent to Dr. Packard. They reached him as pupæ. From one of these an imago appeared, which Dr. Packard wrote me was "an unknown tineid." I am unable therefore to suggest the genus to which it belongs.

Description of larva. Length, 9 to 12 mm.; width anteriorly, nearly 1⅓ to 1½ mm. White; head black, somewhat polished, with a slight reddish area on each side dorsad of eyes; prothoracic segment with dorsum brownish black, except a median longitudinal whitish dividing line. Consisting of thirteen segments; appearing from above as though possessing two extra ones, since the two terminal segments each bear a transverse suture or wrinkle on dorsum. Head and prothorax about equal in width; third segment distinctly wider, segments 4 to 6 nearly same width as 3, 7 and 8 very gradually narrowing, 9 to 11 about or hardly as wide as 8, 12 and 13 gradually narrowing from 11, 13th segment a little more than one-third width of 3d. Head usually not retracted, a little wider than long; prothoracic and third segments a little shorter than head, 4 about as long as head, 5 slightly longer, 6 and 9 to 11 a little longer than 5; 7, 8, 12 and 13 about as long as 5. Head and prothorax chitinous, rest fleshy. Head subhemispherical, convex dorsally, with a few fine hairs on anterior border, and several on dorsum; all the other segments with a number of hairs (about ten) arising from minute papillæ, four usually being dorsal, the others lateral and ventral. Eyes consisting of six small but prominent bead-like glassy

white simple eyes, each with a minute pupil-like black dot; four arranged in nearly a semi-circle, with the exterior or convex side dorsad; the other two situated ventrad of the front one in the semi-circle, one anterior to the other. Labrum rather deeply notched anteriorly, light fulvous; adjoining border of clypeus narrowly concolorous. Antennæ sunken in a small excavation anterior to eyes, apparently two-jointed, joints about equal in length, second hardly narrower and terminated with a style-like hair. Mandibles rather stout, subquadrate in outline, flattened, faintly four-notched, therefore faintly serrate with four or five teeth. Maxillæ and labium whitish; maxillary palpi apparently two-jointed, basal joint stouter, terminal joint more elongate and slender. Three pairs of four-jointed true legs on the thoracic segments, terminated by a brownish chitinous claw. Five pairs of prolegs, on joints 7 to 10, and 13, the anal pair stouter, fleshier, and somewhat longer.

Described from two alcoholic specimens, perhaps not fully grown, taken from cases May 13 and 15. Color of head and body noted in life. The length of the segments is drawn from the better preserved specimen. The proportions are slightly different in the other.

BIRDS OF SAN PEDRO MARTIR, LOWER CALIFORNIA.

BY A. W. ANTHONY.

Mr. W. E. Bryant's excellent Catalogue of the Birds of Lower California has left but little to record from the northern part of that peninsula, but the notes furnished by the present writer were necessarily very fragmentary owing to the collections as well as many notes being inaccessible at the time. It is to correct this deficiency and at the same time record the observations of a trip through that region the past season that the present paper is offered. The expedition crossed the national boundary at Tia Juana, fifteen miles from San Diego, on April 17, 1893, and proceeded by easy stages to the western base of San Pedro Martir by way of Ensenada and Colnett. The first benches of the mountain were not reached until May 5.

Several days were spent at various camps between this point (7000 feet) and the gulf slope which was not reached until May 23. The return march was taken up May 27 and San Diego reached June 7.

During our southward march the migration was at its height and at the time that we left the higher parts of the mountain new arrivals were seen almost daily; it is not improbable that among these late arrivals some Sonoran species might have been found had our time permitted a more thorough investigation. It is probable, however, that most of the species inhabiting the pine belt were noted. The region embraced in the name of San Pedro Martir consists of a high plateau of about sixty-five or seventy miles in length by twenty in width, lying about twenty miles from the gulf, and with its greatest extent parallel with that coast. Most of the plateau would be embraced within the limits of 30° and 31° north latitude. The northern end rises to a height, in one or two peaks, of 12,500 feet, estimated, and from that point the ridges and peaks drop away by degrees until at the southern end they merge into the low, barren hills, common to the peninsula at this point. The east and northern slopes, however, are very steep and rocky, with only two or three almost impassable trails, while the eastern side presents along its entire length in many places a sheer precipice for thousands of feet.

A series of large open meadows is found at an elevation of 8000 to 8500 feet, surrounded by rough, rocky ridges and heavy pine timber. These ridges are characteristic of the entire region which is composed of soft, friable syenite, the softer parts of which in crumbling away have left huge masses of gigantic boulders forming ridges, in many cases impassable. A growth of yellow pine, *Pinus Jeffreyi*, covers the ridges and slopes as low as 7000 feet altitude, where it gives place to a belt of scattered piñons, *P. Parryana*, reaching to 6000 feet or less, a growth of Manzanita and Ceanothus covers all of the slopes and ridges where it is too rocky for the pines to obtain a foot-hold, and in many places a small shrub oak was abundant. The streams, which were abundant, were all fringed with willow and a few Aspens were seen in some localities. Arising as this region

does from a sea of barren dry hills and reaching an elevation higher than any point south of Mt. Whitney, California, it is not strange that its fauna should be unusually interesting although its relationship is with that of the northern mountains.

The birds observed in the pine belt were limited as to species, but abundant individually. A few species were limited to certain localities and were not plenty, but as a rule all were generally distributed. The list has been somewhat extended to embrace a few species not belonging to the mountain region, but unless otherwise stated, all species were found on or about the mountain.

The following species are for the first time recorded from the peninsula:

Carpodacus cassini.
Peucæa ruficeps.
Melospiza fasciata heermanni.
Passerella iliaca megarhyncha.
Troglodytes aëdon aztecus.

Phalacrocorax penicillatus. BRANDT'S CORMORANT. In April, 1889, I was told of a cormorant that had been about my camp at Valladares, six miles from the base of San Pedro. A short time afterwards I found its body in the creek. It had evidently strayed from the coast and followed up the stream until, unable to find its way back, it had starved. A single bird of this species, or *albociliatus*, was seen at San Telmo, ten miles from the coast, April 30.

Anas boschas. MALLARD. Quite a number were nesting in the large meadows on top of the mountain when we arrived, May 13. A nest of eggs, on the point of hatching, was found by my brother, W. W. Anthony, May 17; the nest was placed in a hole under a pile of boulders by the side of the stream and very well hidden.

Anas cyanoptera. CINNAMON TEAL. A few pairs were nesting in La Grulla meadows, May 13. In October, 1887, this meadow was visited and large flocks of ducks of several species were found in shallow ponds formed by the early rains. They cannot, of course, winter in this region, as it is subject to

a fall of not less than six feet of snow, according to native testimony. Mr. Bryant has quoted me as reporting *A. carolinensis* at 9000 feet in winter, a mistake due to my own carelessness, probably. The species was found at that altitude in fall, but not above 1500 feet after November.

Plegadis guarauna. WHITE-FACED GLOSSY IBIS. At San Telmo they were usually seen during summer in small numbers about a large marsh above the settlement, and I think they doubtless bred there. Adults and young were shot at San Quintin in October.

Tantalus loculator. WOOD IBIS. In the fall a few wood ibis are to be found in all of the marshes and streams from Ensenada to Santa Maria.

Botaurus lentiginosus. AMERICAN BITTERN. Common in the marshes at Colnett and San Ramon, where it doubtless nests.

Ardea herodias. GREAT BLUE HERON. Common at San Quintin and north of that point, also seen to some extent inland. A colony was found nesting on San Martin Island on April 12. At this date most of the nests contained young, but one set of three fresh eggs were taken.

Ardea candidissima. SNOWY HERON. Very common all along the coast from El Rosario north. I think they nest at San Ramon, as they were seen at that point all summer.

Ardea rufa. REDDISH EGRET. Not uncommon at San Quintin.

Fulica americana. AMERICAN COOT. Coots were seen occasionally along the creek below Valladares in the fall. Young were found at San Telmo as early as April 1. A pair was found nesting on San Pedro in May, 1889.

Recurvirostra americana. AMERICAN AVOCET. Not uncommon at San Quintin, Colnett and Ensenada in fall, only seen, however, about the fresh water marshes.

Actitis macularia. SPOTTED SANDPIPER. One was seen at La Grulla, on San Pedro, May 14. Rather common along the coast.

Ægialites vocifera. KILLDEER. A few were found in all the meadows on top of the mountain.

Oreortyx pictus confinis. SAN PEDRO PARTRIDGE. Since describing this race, I have secured a series of skins from San Diego County, California, that are practically identical with my skins from Lower California, San Pedro and Valladares, thus making it necessary to either ignore the Lower California bird, or to include Southern California in its habitat. I am unable to secure specimens from the type locality at present, and so cannot determine the status of the race beyond a doubt.

A single skin from the collection of the California Academy of Sciences, from Monterey, is slightly darker above and shows a conspicuous rusty edging to several of the secondaries, forming a patch on the closed wing not seen in any of my southern birds.

During the past season partridges were found in abundance all over San Pedro Martir and fresh eggs were taken from the time of our arrival May 5 to the last day, May 28.

In the Gaudaloupe Valley, forty miles south of Ensenada, several Oreortyx were seen in the thick chaparral of Ceanothus, almost down to the coast.

Callipepla californica vallicola. VALLEY PARTRIDGE. In October, 1887, this species was found to be quite common on San Pedro as high as La Grulla 8200 feet. It was again met with in April and May 1889 and the past season, but in comparatively small numbers. Birds taken in May (5th to 25th) contained in several cases eggs ready to be deposited.

Capt. C. E. Bendire, in "Life Histories of North American Birds," has recorded my observations regarding the non-nesting of this species during very dry seasons; this habit was again noticed the past season and under very favorable conditions.

Upon our return trip from the base of the mountain to San Diego the present species was abundant, but it was only in the well-watered valleys that they were paired or that young were seen. The past winter and spring had been unusually dry and in many valleys water was entirely absent and vegetation generally very scant and dry. In such localities quail were all in flocks and those that were shot showed little if any enlargement of the ovaries. Small young were seen at San Telmo, a well-watered valley, on May 30.

Pseudogryphus californianus. CALIFORNIA VULTURE. The first evidence that I found of the occurrence of the condor in Lower California was the finding of a dead bird in Guadaloupe Valley, forty miles south of Ensenada and near the coast; later another carcass was found in the dry barren hills east of El Rosario, about 30° north, which was the most southern point where positive evidence of its occurrence was obtained. My brother, W. W. Anthony, reported seeing these birds at one time near Real Del Castillo in the San Rafael Valley.

On San Pedro Martir they are of rather common occurrence, being seen daily about the meadows at altitudes of 8000 and 9000 feet. The Indians told me that their nests were to be found on the high cliffs of the gulf slope and others informed me that they built in the tops of large pines.

I greatly doubt the last statement, however. Every Indian and Mexican gold miner is provided with from one to six of the primary quills of this species for carrying gold dust, the open end being corked with a plug of soft wood and the primitive purse hung from the neck by a buckskin string. All of the dead birds that I saw in Lower California had been killed for their quills alone.

Cathartes aura. TURKEY VULTURE. Common during the summer all over the mountain, usually seen in company with the condor and raven.

Parabuteo unicinctus harrisi. HARRIS'S HAWK. Through some mistake my notes on this species were included under the head of *Buteo lineatus elegans* in Mr. Bryant's list. During the last season Harris' hawk was seen in one or two valleys between Ensenada and Colnett, and in one or two places on San Pedro as high as 7000 feet. It was nowhere common, however.

Buteo borealis calurus. WESTERN REDTAIL. Very common throughout the northern part of the peninsula, and found nesting in abundance in the pines on San Pedro. Nearly all of the pairs seen last spring consisted of one very light colored and one melanistic bird. At La Grulla a pair of redtails were nesting near our camp. The male was a very light bird, while the female was so dark as to be several times mistaken for the dark

phase of *swainsoni*. On May 16 the female was shot as she rose from the nest, and on skinning her I found in her stomach the remains of a *Cyanocephalus* and a nearly complete rattlesnake that must have measured over two feet in length. On the following day the male was seen flying about the nest with another female fully as dark as his former mate, and I was surprised to see her feeding young ten days or two weeks old. I had supposed the nest still contained eggs. As it was such a clear case of adoption I concluded to leave them undisturbed, but the unfortunate male was doomed a few days later to lose his second mate which was shot by a member of our party; upon dissection this bird was also found to have a large rattlesnake coiled up in her stomach. We frequently saw redtails sailing about over the meadows with large snakes hanging from their talons.

Buteo elegans lineatus. RED-BELLIED HAWK. Not seen this season south of Ensenada. It seems to be confined chiefly to the creek bottoms where cottonwood and sycamore growths afford it convenient nesting sites.

My notes on this species in Mr. Bryant's list refer to Parabuteo.

Buteo abbreviatus. ZONE-TAILED HAWK. On April 24, 1889, two pairs were found nesting on San Pedro at elevations of 7000 and 7500 feet, and one of the birds secured. The past season only an occasional stray bird was seen, not over four or five, and no nests were observed.

Buteo swainsoni. SWAINSON'S HAWK. One of the most common species in all of the lower valleys, but does not seem to extend very high up on the mountain, as I do not remember seeing it above 3000 feet. One that I shot in the Guadaloupe Valley on April 24 had its inner secondaries and tail feathers so badly burned as to render it unfit for the cabinet. The only explanation seems to be that the bird was hunting near some of the brush fires in the valley and attempted to take a rabbit or other game too near the fire, or perhaps it was attempting to cook its dinner.

Aquila chrysaëtos. GOLDEN EAGLE. No eagles were seen

on San Pedro the past season; they appear to be very rare there. At San Telmo a pair have for years nested in a cliff about ten miles from the coast, where they were seen in April of the present year.

Falco sparverius sub. sp.(?) SPARROW HAWK. One or two sparrow hawks were seen on top of San Pedro, but as no specimens are in the collection I am unable to say which race occurs there.

Strix pratincola. AMERICAN BARN OWL. Very common in the lower valleys, but not observed above the live oak belt at 3500 feet.

Syrnium occidentale. SPOTTED OWL. An owl that I think was this species was flushed from a live oak on the slope of San Pedro at about 4500 feet elevation. Mr. Bryant has recorded a bird that I saw near the same place in 1887.

Megascops asio trichopsis.(?) MEXICAN SCREECH OWL. Screech owls have several times been seen and heard between the coast and the top of San Pedro, but as no specimens were secured the exact position of the sub-species is somewhat doubtful.

Bubo virginianus subarcticus. WESTERN HORNED OWL. Very common in the pine timber of San Pedro and in the coast valleys where there is timber enough to afford it shelter.

Speotyto cunicularia hypogæa. BURROWING OWL. Seen in several of the valleys between Tia Juana and San Telmo. I think none were seen above that point. On June 9 an entire family were seen in the Carriso Valley, perched on the bushes about the burrow.

Glaucidium sp. (?) PIGMY OWL. At Valladares, near the base of the mountain, two were seen by a member of our party, but not secured.

Geococcyx californianus. ROAD-RUNNER. Common in the lower valleys and slopes of the mountain. One was reported to me from 7000 feet.

Ceryle alcyon. BELTED KINGFISHER. One was heard on two or three occasions at La Grulla, on San Pedro. Common on the coast in winter.

Dryobates villosus hyloscopus. CABANIS'S WOODPECKER. Not uncommon in the pines on San Pedro. Given as *harrisii* in my notes in Mr. Bryant's list.

Dryobates scalaris lucasanus. ST. LUCAS WOODPECKER. A specimen taken April 30 at San Telmo and others seen. I have frequently seen *Dryobates* in the cacti along the coast hills from San Fernando north, but owing to their extreme shyness have usually failed to take specimens. It is quite probable that the notes furnished Mr. Bryant regarding the finding of *D. nuttallii* among the cacti of the coast belong to the present species, as I do not think I have ever seen *nuttallii* away from deciduous trees.

Dryobates nuttallii. NUTTALL'S WOODPECKER. Common along all the timbered streams as high as 4000 feet, or the limit of the live oaks and sycamores.

Melanerpes formicivorus bairdi. CALIFORNIA WOODPECKER. Well distributed through the pines on San Pedro, and probably resident; nowhere very plenty, but more common in the oak growth from Ensenada north.

Colaptes cafer. RED-SHAFTED FLICKER. Rather common on San Pedro, descending to the lower valleys in winter.

Phalænoptilus nuttallii californicus. CALIFORNIA POOR-WILL. Poor-wills were very abundant in the lower valleys in late April of the past year, but none were heard above 4500 feet until May 8, when one was heard at our camp at 7000 feet. They were heard at 8500 feet May 25, and one taken at the western edge of the mountain on May 28 was evidently nesting. They were much oftener heard than seen, as they are not much on the wing.

Chordeiles texensis. TEXAS NIGHT-HAWK. Quite common in the lower valleys, especially about the water holes; one seen as high as La Grulla—8200 feet.

Cypseloides niger. BLACK SWIFT. At San Telmo a pair of these swifts appeared about camp several times during the forenoon of April 30th, and one was shot by a member of the party; not noticed again.

Chætura vauxii. VAUX'S SWIFT. At Tia Juana April 16,

I found a small flock of these swifts flying about over a pool of water in company with *Petrochelidon* and *Tachycineta thalassina*. Later they were seen in several localities as far south as Colnett and San Telmo; at this point they were quite common April 30, and evidently migrating in company with swallows. A single bird was seen at La Grulla May 18.

Aëronautes melanoleucus. WHITE-THROATED SWIFT. Seen in several valleys between Tia Juana and the base of San Pedro but all evidently migrating. On top of the mountain they appeared about our camp by dozens and could easily have been taken in large numbers; they were mating and preparing to nest in the high cliffs on the eastern side of the mountain where I found them in 1889. A small colony was found nesting in the cliffs at San Ysidro in May, 1887. On the Coronado Islands, twenty miles from San Diego, a colony was discovered nesting in a cliff overhanging the surf, not over thirty feet above the water, but as usual the nests were inaccessible.

Calypte costae. COSTA'S HUMMINGBIRD. Very abundant in all of the valleys along the coast and base of the mountain; not seen in the pines until about May 20; on May 28 they were building at 7500 feet.

Calypte annae. ANNA'S HUMMINGBIRD. A very common resident of the coast region; not seen until May 15 at La Grulla. As this species, as well as the preceding, nest in March, sometimes as early as February in the lower valleys, it is not at all improbable that the birds that we found in May on the mountain had raised a brood before migrating.

Tyrannus verticalis. ARKANSAS KINGBIRD. One was seen May 15 at La Grulla, the only one seen in the pines; very common in the coast valleys.

Myiarchus cinerascens. ASH-THROATED FLYCATCHER. A few were seen on San Pedro in 1889, and again the past season, but it was not at all abundant; in the lower valleys it is more common. A nest and set of four fresh eggs were taken from a hollow on an elder in the Guadaloupe Valley, June 2.

Sayornis saya. SAY'S PHŒBE. Quite common along the base of the mountain and in all of the coast valleys below 4000

feet. At Valladares they were given to nesting in all of the deserted mines, and I have found their nests twenty feet below the surface of the ground in an old shaft or tunnel.

Sayornis nigrescens. BLACK PHŒBE. Quite common along all of the water courses and resident as high as 3000 feet at least; a single pair were nesting at La Grulla May 22.

Contopus borealis. OLIVE-SIDED FLYCATCHER. Abundant throughout the pine belt, one in my collection from that region has a large, clear, white patch on the throat, lacking entirely the streaking common to that species.

Contopus richardsonii. WESTERN WOOD PEWEE. Very common in San Pedro; one that had its nest in a large pine over our camp on the night of May 28, kept up a calling at intervals of thirty minutes all night.

Empidonax cineritius. ST. LUCAS FLYCATCHER. Very common all over the mountain, especially along the streams and in the willows. It was evidently nesting at the time of my visit in May, but no eggs were taken. From its preference for willow thickets at this time I would expect to find its nests in such places as *E. wrightii* might choose.

Empidonax pusillus. LITTLE FLYCATCHER. Seen only during migrations.

Otocoris alpestris chrysolæma. MEXICAN HORNED LARK. Along the coast as far as Colnett, at least the horned lark belongs to this race as shown by specimens in my collection. At San Quintin, however, fifty miles further south, *pallida* is the race met with during the breeding season if not the entire year. Mr. Townsend's types of *pallida* came from the region just east of San Pedro, which with the San Quintin record on the west led me to expect this form from the mountain meadows. No larks were met with, however, until the eastern edge was reached; here a few were taken that were all true *chrysolæma*.

Otocoris alpestris pallida. SONORAN HORNED LARK. My notes were given to Mr. Bryant and published by him under the name of *rubea*. It seems, however, from the material I have at present that *pallida* is the form found at San Quintin during the

nesting season, giving away to *chrysolæma* a short distance to the north and east.

Aphelocoma californica obscura. BELDING'S JAY. The status of this race is in a condition similar to that of the San Pedro Partridge as already stated. San Diego County birds are indistinguishable from those from San Pedro, but I am unable to secure typical *californica* from Monterey, the type locality. It seems, however, from the series now on hand as if *obscura* would have to be reduced to a synonym of *californica*.

Corvus corax sinuatus. AMERICAN RAVEN. Very common from the coast to the highest point visited on San Pedro.

Picicorvus columbianus. CLARK'S NUTCRACKER. In May, 1889, a single specimen was secured at La Grulla from a flock of *Cyanocephalus.* Later the fragments of another were found where they had been left by a hawk or owl; not met with in 1893.

Cyanocephalus cyanocephalus. PIÑON JAY. Very abundant in the pines on San Pedro. Those taken had their stomachs full of beetles and insects that they had caught in the grassy meadows.

Icterus cucullatus nelsoni. ARIZONA HOODED ORIOLE. Very common along the base of the mountain and in all of the lower valleys, but not seen above the live oaks at 4500 feet.

Scolecophagus carolinus. RUSTY BLACKBIRD. The capture of a single specimen at the base of the mountain has been recorded in Mr. Bryant's list.

Scolecophagus cyanocephalus. BREWER'S BLACKBIRD. Common in all of the lower valleys; at San Vincente a large colony had taken possession of the old olive trees at the abandoned mission and dozens of nests with eggs were seen on April 28. At La Grulla they were nesting in the pines in early May; they were not noticed away from the large meadows, however.

Carpodacus cassini. CASSIN'S PURPLE FINCH. Not uncommon on San Pedro in the pines where it is probably resident; often seen in flocks of the following but very shy and difficult to secure. Not given in Bryant's list.

Carpodacus mexicanus frontalis. HOUSE FINCH. Abundant resident in all of the lower valleys; on San Pedro a few only were found upon our arrival, May 5, but they soon became abundant, especially about the meadows. Specimens from that region are not materially different from Southern California skins in my collection.

Spinus tristis. AMERICAN GOLDFINCH. A few winter about the base of the mountain.

Spinus psaltria. ARKANSAS GOLDFINCH. A common resident about the northern part of the peninsula reaching the lower slope of the mountain.

Spinus lawrencei. LAWRENCE'S GOLDFINCH. Common with the preceding species; not seen above 4000 feet on San Pedro.

Spinus pinus. PINE SISKIN. Well distributed through the pines on San Pedro, but undoubtedly not common; no nests were found.

Ammodramus sandwichensis alaudinus. WESTERN SAVANNA SPARROW. A few winter about the base of San Pedro.

Ammodramus rostratus. LARGE BILLED SPARROW. Very common in fall and winter all along the coast, but never wandering far from salt water. It is considerable of a mystery to me to locate the nesting grounds of this species. Thousands of birds are seen in all of the salt marshes along the coast from the northernmost limit of its range. No decrease is noticed in their numbers until the nesting season approaches, when they suddenly disappear and are not again noticed until August, when they make their appearance with young, and are common about the old haunts until the following spring.

On one occasion Mr. A. M. Ingersoll discovered at San Diego a bird carrying food for its young, but was unable to find the nest owing to the great distance to which the bird flew with its load. On the beach in April, 1887, I shot a female at San Ramon that had undoubtedly left her eggs but a few moments before. As the birds were scarce at that point and I was unacquainted with the rarity of their eggs, I made no effort to find their nests, and, although I have patiently searched for them ever since, I have never again seen birds during the nesting

season. The character of the ground at San Ramon, where a few were undoubtedly nesting, was a broad sand beach, covered with drift-wood, flanked by a few sand dunes, back of which was a series of small lagoons of brackish water, thickly grown to tules. The eggs of this species which are frequently offered to the public by local collectors of Southern California have, so far as my observations have gone, always been taken from the nests of *A. beldingi.*

Zonotrichia leucophrys. WHITE-CROWNED SPARROW.

Zonotrichia leucophrys intermedia. INTERMEDIATE SPARROW.

Zonotrichia leucophrys gambeli. GAMBEL'S SPARROW. All of the white crowns are abundant about the base of San Pedro during the winter months, and a few are to be seen in the pines during migrations. But few specimens were taken and the comparative abundance of the different species was not determined.

Zonotrichia coronata. GOLDEN-CROWNED SPARROW. Quite common during the migrations with the white crowns but seems to winter farther south than the bulk of these species. All of the *coronata* taken in April were moulting and unfit for specimens.

Spizella socialis arizonæ. WESTERN CHIPPING SPARROW. Very abundant about the base of the mountain and resident; one was shot at 7000 feet elevation May 10.

Spizella atrigularis. BLACK-CHINNED SPARROW. Rather common in the hills from the coast to the base of the mountain. I have no specimens from the pine belt, but am sure that its song was heard in May, 1887, at 10,000 feet elevation.

Junco hyemalis thurberi. THURBER'S JUNCO. It is quite probable that all of the Lower California records of *oregonus* belong to the present species. I found them about the base of San Pedro in winter with *townsendi*, and met with them in the Burro Cañon north of Ensenada April 23, the past season.

Junco townsendi. TOWNSEND'S JUNCO. Very abundant throughout the pine region of San Pedro, only reaching the lower elevations in winter. The past season the juncos were found building upon our arrival in the pines, May 5, but no

eggs were found until the 10th. A set of three were taken at La Grulla on the 14th, that were about to hatch. The nest was in an old woodpecker's hole in a large pine that had been blown down, with its top resting on a big boulder. The hole which was about six feet from the ground was on the under side of the trunk and the nest about on a level with the opening; it was composed of dry grasses and lined with deer hair. A nest which was found on May 26 in a hole in a rotten stub about ten feet from the ground contained three eggs slightly incubated. A number of nests, which were found under logs, boulders and similar locations and left for full sets, were all destroyed. Several birds were shot while carrying large bills full of deer hair for nest lining.

Peucæa ruficeps. RUFOUS-CROWNED SPARROW. A series of four skins taken between Tia Juana and the base of San Pedro are practically indistinguishable from Southern California examples; seems to be rather common in a few favored localities along the base of San Pedro.

Melospiza fasciata heermanni. HEERMANN'S SONG SPARROW. Through an error I referred the San Pedro song sparrows to *rivularis* in my notes published by Mr. Bryant. They seem to be true *heermanni*, however. Along the creeks and about water holes this form is more or less abundant from San Diego to the top of San Pedro.

Passerella iliaca megarhyncha. THICK-BILLED SPARROW. A few were seen in October on San Pedro and on one or two subsequent occasions at Valladares.

Pipilo maculatus megalonyx. SPURRED TOWHEE. Not uncommon in the Manzanita and shrub oak growth on San Pedro.

Pipilo fuscus crissalis. CALIFORNIAN TOWHEE. Very abundant along the lower slopes of the mountain, but rather rare in the timbered regions; confined here chiefly to the rocky ridges and Manzanita growth.

Habia melanocephala. BLACK-HEADED GROSBEAK. Quite common during migrations along the base of the mountain; a few

were seen as high as 4000 feet and were probably nesting at that altitude.

Guiraca cærulea eurhyncha. WESTERN BLUE GROSBEAK. Very common in all the coast valleys from San Quintin northward; usually seen in the region of cultivated fields and willow thickets. They were seen in the San Telmo up to within a short distance of the mountain.

Passerina amœna. LAZULI BUNTING. Abundant with the preceding species, with which it was often seen; one or two were seen on top of the mountain.

Piranga ludoviciana. LOUISIANA TANAGER. Quite common; not seen above 7000 feet.

Progne subis hesperia. WESTERN MARTIN. Very common; nesting in colonies from Valladares, 2500 feet altitude, throughout the pines.

Petrochelidon lunifrons. CLIFF SWALLOW. Common in colonies from the coast to the top of the mountain; they were found nesting on the sides of huge granite boulders in meadows of La Grulla May 13, and later on the eastern side.

Chelidon erythrogastra. BARN SWALLOW. A few were noted on top of the mountain; more common along the coast.

Tachycineta thalassina. VIOLET-GREEN SWALLOW. Very abundant from Valladares to the top of the mountain; nesting in hollow pines throughout the region visited. On May 19 a large number of females gathered about camp attracted by the feathers of some mallards that had been shot for the table. Usually the coveted feather was secured without the ceremony of alighting, the bird hovering over the pile until a feather was selected, and then securing it by a dainty dip of the head and immediately dashing off to the nest. A day or so later I shot a junco from a tall pine, which in falling detached a number of feathers. These were almost instantly secured by a flock of these swallows, and before a feather had reached the ground they were all appropriated with the exception of one long white rectrix which was several times caught and as often rejected.

Ampelis cedrorum. CEDAR WAXWING. Rather common about Valladares, where a specimen was secured May 4. I

have never seen any on San Pedro, but several times thought that I heard their call notes.

Phainopepla nitens. PHAINOPEPLA. Very common at certain times about the base of the mountain up to about 6000 feet.

Vireo solitarius cassinii. CASSIN'S VIREO. Not uncommon in the pines where it was first seen May 13; it became more common a week or so later.

Vireo bellii pusillus. LEAST VIREO. Very common all along the base of the mountain, but probably not reaching above the live oaks at 4500 feet.

Helminthophila celata lutescens. LUTESCENT WARBLER. Seen along the western base of the mountain and in all the lower valleys during the spring migration.

Dendroica æstiva. YELLOW WARBLER. Common during migrations in the valleys and as a summer resident in the higher altitudes. A single skin in my collection from La Grulla, No. 4031, May 15, is the brightest colored specimen I have ever seen from any locality, and also differs from others in my series in having a well defined dark shaft streak along the inner web of the tail feathers, occupying half of the web which is yellow to the shaft in all *æstiva* that I have examined. Unfortunately the specimen is the only one I have from that region, and I am unable to say how constant the character may prove to be.

Dendroica auduboni. AUDUBON'S WARBLER. Very abundant during migrations; one taken at La Grulla, May 13.

Dendroica nigrescens. BLACK-THROATED GRAY WARBLER. Rather common as a summer resident in the pine belt, nesting in the Manzanita thickets.

Dendroica townsendi. TOWNSEND'S WARBLER. During the past spring this warbler was first met with in the Burro Cañon, where a dozen or more were seen in the live oaks, April 23. As they were quite restless and somewhat difficult to identify, it is not improbable that *occidentalis* also occurred at this same place. They were again met with at Valladares, May 3, and on the following day on the west side of San Pedro at each of these localities they were quite common in the live oaks with *D. nigrescens* and *occidentalis.*

Dendroica occidentalis. HERMIT WARBLER. Quite common at Valladares and on San Pedro at 4500 feet; several were taken at each camp.

Geothlypis trichas occidentalis. WESTERN YELLOW-THROAT. A female was taken at La Grulla, May 1, 1889; not uncommon about the base of the range.

Icteria virens longicauda. LONG-TAILED CHAT. Common in the lower valleys, but only seen occasionally along the base of the mountain.

Sylvania pusilla pileolata. PILEATED WARBLER. Before we left the pine belt, this warbler had become common along the streams; more abundant, however, in the lower valleys during migrations.

Anthus pensilvanicus. AMERICAN PIPIT. A few seen in May, 1889, on the eastern edge of the mountain; abundant along the coast in winter.

Mimus polyglottos. MOCKINGBIRD. Probably does not extend above 5000 feet on the western slope of the mountain.

Harporhynchus redivivus. CALIFORNIA THRASHER. Not uncommon in the Manzanitas at 7000 feet, but rare above that point; a pair of Harporhynchus was seen in the shrub oaks at about 10,000 feet altitude that I thought was *crissalis*, but as they were not taken, the record is open to question.

Campylorhynchus affinis. ST. LUCAS CACTUS WREN. Common as far up the San Telmo Valley as suitable nesting ground was seen, about thirty miles from the coast. Mr. Bryant recorded it from as far north as San Quintin, fifty miles south of San Telmo.

Salpinctes obsoletus. ROCK WREN. One found nesting at 8500 feet; more common on the lower slopes.

Catherpes mexicianus punctulatus. DOTTED CAÑON WREN. Not uncommon in several places on San Pedro.

Thryothorus bewickii spilurus. VIGORS'S WREN. Common along the western slopes of the mountain.

Troglodytes aedon aztecus. WESTERN HOUSE WREN. Abundant in the pines.

Sitta carolinensis aculeata SLENDER-BILLED NUTHATCH. Rather rare but well distributed in the pines.

Sitta pygmæa leuconucha. WHITE-NAPED NUTHATCH. The most abundant species on the mountain; found everywhere in the pines. Upon our arrival May 5 this species was mating; noisy little companies of five or six to a dozen were seen chasing one another through the pines, chattering and calling from daylight till dark; although dozens of nests were discovered all were practically inaccessible. A favorite location for the burrow was on the under side of a dead branch, well away from the trunk of a large pine, and from twenty-five to a hundred feet from the ground. A series of over one hundred and thirty skins sustain the characteristics of the types to a very gratifying degree.

Parus inornatus griseus. GRAY TITMOUSE. Seen in several localities on San Pedro but not at all common. Specimens from the base of the range were identified as *griseus*, but as I have no specimens from the pine belt I can only surmise its identity.

Parus gambeli. MOUNTAIN CHICKADEE. Abundant in the pines but found chiefly in the region of Manzanita and oak thickets. In winter it was seen about Valladares and along the lower valleys.

Chamæa fasciata henshawi. PALLID WREN-TIT. Common along the lower slopes of the mountain and not rare in the highest altitudes where it nests in the shrub oak and Manzanita.

Psaltriparus minimus californicus. CAIFORNIA BUSH-TIT. Not common in the pines, but noted from several localities; very abundant below 3000 feet.

Regulus calendula. RUBY-CROWNED KINGLET. Rather common during migrations.

Turdus ustulatus. RUSSET-BACKED THRUSH. Seen in the pines as late as May 25; a female taken May 21; it is possibly a resident of the pines, but those taken showed little enlargement of the ovaries, and it is more probable that they were belated migrants.

Merula migratoria propinqua. WESTERN ROBIN. Common along the base of the mountain in winter; a few were seen in May, 1889, at La Grulla, but none were noted the past season.

Sialia mexicana. WESTERN BLUEBIRD. Very common during migrations from sea level to the top of the range, a few lingering to nest with the local race. A series of seventy-five skins taken the present year during the nesting season sustain the characters of *anabelæ*, as set forth by myself in 1889, to a strong degree, only about 5% of the males showing an unbroken band of bay on the breast, which refers them to true *mexicana*, and many of the high-plumaged males of the *anabelæ* stripe were almost entirely without bay markings on either breast or scapulæ.

LEUCARCTIA RICKSECKERI.

DR. H. H. BEHR.

Mr. L. E. Ricksecker sent me four specimens of a Leucarctia which he raised from larvæ found on a species of Senecio, and after careful comparison as to description and figure of *L. albida*, Stretch, I think that Mr. Ricksecker is justified to consider them a new species.

As Mr. Ricksecker lives in the country, rather isolated from scientific intercourse, he has empowered me to publish and name the species. I call it after its discoverer.

L. RICKSECKERI: ♂ grisea, ♀ alba. In utroque sexu palpi annulis duobus et apice atro signati. Antennæ atræ supra serie punctorum minimorum candidorum signatæ. Abdomen luteum, crines basales segmentumque apicale albi, series punctalis dorsalis atra. Alæ ♂ ris anticæ griseæ fasciis dilutis obscuris, posticæ sordide luteæ puncto discali et duobus submaginalibus dilutis. In utriusque sexus alis anticis ad bifurcationem venæ medianæ puncto atro bene distincto notatæ.

L. Rickseckeri is about the size of small specimens of *L. Acræa*. ♀ wings immaculate, except a minute black discal spot on anterior wing. Body similar to *L. Acræa*, but with the black spots fainter, sometimes obsolete. ♂ thorax and anterior wings a diffused smoky color, immaculate except the minute discal spot. Posterior wings yellowish-brown with one discal and two or three submarginal spots quite indistinct and nearly obsolete. Both pairs of wings are brown underneath with a few variable obsolete black points.

I have very little to add to this description of the insect by Mr. Ricksecker. It is true the description of *L. albida* by Stretch could be construed into a description of *L. Rickseckeri* ♀. Mr. Stretch states that the specimen (a unicum) from which he described was in very bad condition, so that the discal point may have been wiped off in both anterior wings, and even the sex may have been mistaken, as the circumstance of the specimen being a unicum prevented dissection. No entomologist likes to destroy a unicum. But the characteristic of the palpi distinguishes the species at once and leaves no doubt as to its specific distinction. Coloration and markings of the ♂ distinguish the species from all American Leucarctias, and approach it to an East Indian species in our collection, which I received in several specimens from the coast of Arracan. This otherwise very distinct species has the same coloration as the ♀.

In regard to its biology, I give here again the words of Mr. L. E. Ricksecker: "June 11, 1891, I found three larvæ about full-grown, similar in general appearance to those of *L. Acræa* on a species of Senecio. They commenced spinning cocoons June 18, and three males emerged July 18, 1891. June 18, 1893, I visited the same place, and after a long day's diligent search I had twelve caterpillars. June 15, they commenced spinning cocoons; June 20, eight cocoons (the remainder escaped from cage); July 5–12, six imagines— ♂ 2, ♀ 4. Two cocoons contained parasites. Locality, Sonoma County." These are the notes of Mr. Ricksecker's journal.

CALIFORNIA EARTH-WORMS OF THE FAMILY OF EUDRILIDÆ.

BY GUSTAV EISEN.

California, although a dry and rainless country for six months in the year, still possesses a varied oligochætological fauna rich both in species and individuals. The earth-worms—angle and rain-worms—burrow deep in the soil during the dry and warm months and lie there encysted and closely rolled up in clay chambers and waiting for the rain to set in in the autumn.

With these first rains in October the worms leave their self-made clay chambers and ascend to the upper strata where they live and propagate during the winter months, until April and May, when the same process of summer-rest is gone through again. In the large and dry valleys earth-worms are always scarce, owing, of course, to the greater dryness of the plains in summer time. In the driest places the worms are entirely wanting, except, possibly, in some bogs and swamps, where an indigenous species of Allolobophora is always common.

The higher earth-worms (the water-worms excepted) in California can be referred principally to two large families, Lumbricidæ and Eudrilidæ, there being besides one single species of Acanthodrilidæ. It must, however, be stated that the Pacific Coast has not been thoroughly explored, and many more species, genera and families, are likely to be discovered. A species of Perichæta is found in a nursery hothouse in San Francisco, undoubtedly introduced from the tropics. In the Baja California cape region other tropical forms appear, and the common earth-worm there is a species of Urochæta, as well as one or more of Allolobophora.

So far no true earth-worms have been described or even enumerated from California with the exception of two species described by Kinberg. About thirty years ago he visited California and described *Lumbricus apii* from Sausalito near San Francisco and *Pheretima Californica* from the same place. But the descriptions of these species are so insufficient that the worms cannot even be identified as to family, much less to genera and species. They must of course be ignored.

"Pheretima," he says, "has from forty to fifty-six setæ on every segment, and was found both in the hills of San Francisco and in soil at Sausalito." But though I have repeatedly searched in those localities I never succeeded in finding any worms thus characterized, and I am inclined to think that Kinberg's labels became mixed, and that Pheretima at least was never found in this State. Of the family Lumbricidæ California possesses probably a dozen species, some of which are common the world over. There are, however, a number of indigenous species, the description of which will be reserved for a future article. The most common of the Lumbricidæ is a large species of Allolobo-

phora, dark brown in color and which inhabits wet places. There is no Lumbricus. By far the most numerous worms belong to the family of Eudrilidæ. They are easily distinguished by their pinkish color, coupled with the fact that the male papillæ open in the posterior part of the clitellum. There are of this family two distinct genera with at least four or five species, some of which are large, others very small, resembling in size Ocnerodrilidæ, which latter genus is represented by at least one species, which however may be of southern importation, as its distribution is exceedingly limited. In Baja California two genera of this family are represented by at least two species, and in Mexico and Central America by many. It possesses a large southern distribution.

I have so far distinguished the following genera and species in California, of which a more detailed account is soon to be published in the publications of the California Academy of Sciences of San Francisco.

DELTANIA GEN. NOV.

Prostomium dovetails somite i. Eight setæ in four couples, beginning on somite ii. Setæ of the inner couples in the genital region converging towards the male pore. Buccal cavity, pharynx, œsophagus and sacculated intestine, but no gizzard and typhlosole, nor œsophageal pouches. Clitellum xiii to xvii. No dorsal pores. Testes in x and xi. Spermsacs present and free. Spermatheca present or absent. Ovary one pair in xiii, oviduct in xiv. No ovisac. Spermducts open in xvii together with a large paired prostate. The spermducts join the muscular part of the prostate in the body wall. Penial setæ open in the same duct as the prostate. No subneural vessel. The anterior few nephridia open in front of seta 4, the posterior nephridia in front of seta 3. All nephridia furnished with a large terminal bladder near the body wall.

Small, transparent, glossy worms with orange-colored clitellum, living in moist, especially sandy soil. The genus differs from Microscolex principally by the deltoid arrangement of the ventral setæ in the vicinity of the male pore.

The genus appears indigenous to the American Continent, species having, however, been found in Australia and Madeira,

though it is probable that the Australian species has been introduced from some other country.

There are at least three California species.

DELTANIA ELEGANS n. sp. Size two to four inches. Septal glands very small, the posterior one being the smallest. Spermatheca variable, very pellucid, assuming the nature of a spermsac. Spermsacs small, deeply lobed, one pair in xi and one in xii. Prostate helix-like at the top. Penial papillæ with two or more penial setæ in each sac.

Habitat.—San Francisco, Berkeley, Mount Diablo, Santa Rosa, or in general, the country surrounding San Francisco Bay. Is probably of a much wider distribution.* This is the largest species of the genus so far known.

The most important feature of this species is the abnormal construction of the spermatheca. Instead of being a highly muscular and glandular organ with a muscular duct, it simply consists of a very thin-walled sac or membrane in which spermatozoa are stored. But the most peculiar fact connected with the spermatheca is, that it is variable in position, sometimes being median, sometimes paired, or sometimes entirely absent, thus demonstrating the great variability of the organ. This species differs from *Deltania dubia* Fletcher by having the anterior nephridium commencing already in somite ii, the latter species having the first nephridium in v.

DELTANIA TROYERI n. sp. A very minute species of the size of an Enchytræus, largest specimen about one and one-fourth inches by one-half line, while most specimens are smaller. Septal glands large, the one in vi the largest. One pair of large, opaque and permanent spermatheca with one pair of diverticula in ix opening viii ix. One developed seta in each sac of penial setæ. Prostate tubular, not helix-like at the top. Penial exterior papillæ not prominent. The inner couples of setæ are further apart than in the following species. The diverticula of the spermatheca are about one-half or more longer than the spermatheca.

* Since writing the above I have found two species of Deltania in Baja California at Ensenada; the genus has thus a wide distribution.

Habitat.—Golden Gate Park, San Francisco, together with the former species. First found by Mr. Carlos Troyer, to whose interest and kindness I owe the possession of several new species of Oligochæta.

Deltania Benhami n. sp. Size about one inch by one-sixteenth. The inner couples of setæ as well as the setæ in the inner couples are much closer together than in any of the other species. The spermatheca large, opaque, in ix, opening viii, ix, with two diverticula, which are less than one-half as large as the central spermathecal sac.

A small, very hyaline worm, entirely distinct from the preceding species and at once characterized by the closeness of the ventral setæ, and by the size of the spermathecal diverticula. Much more pellucid than the preceding species. Blood yellow.

Habitat.—In the small cañon coming from Lake Chabot, Alameda County, Cal., under moss or in the top soil at the foot of trees near the creek.

ARGILOPHILUS GEN. NOV.

A genus related to Plutellus Perrier, but characterized as follows: Prostomium encroaches on the peristomium. Eight setæ in four couples, commencing in ii. The setæ of the inner couples not converging toward the male-pore, but closer set than the setæ of the outer couples. Buccal cavity, pharynx, œsophagus, gizzard, tubular-intestine, sacculated intestine, typhlosole, but no œsophageal glands or pouches. Clitellum not developed ventrally. Spermathecal pores between vii/viii and viii/ix. One or two longitudinal *rows* of ventral papillæ. Two pair of spermathecæ. Testes in x, xi. Spermsacs paired in x, xi, xii, some of which enclose the ciliated funnels. Two pair of spermducts, which join their respective very large coiled prostates in xviii, at the upper end of the muscular duct. Two penial setæ open in the same pore, but not in the same duct as the prostate. Nephridia without any vesicle at the body wall. Nephridia pores open variably, some in front of the third, some in front of the fourth, and others outside of, or lateral of the fourth setæ, without any serial regularity. Blood red.

Large earth-worms with thick round bodies and pale flesh—

color, marbled bluish. As far as known, California possesses two outwardly distinct forms, but which on account of their exact similarity as regards their internal anatomy, I must refer as subspecies to the same general species.

ARGILOPHILUS MARMORATUS ORNATUS n. sp. The ventral side of the genital somites furnished with two longitudinal rows of ventral sensory papillæ, one row on each side of the median line. The number of papillæ, which are strictly intersegmental, varies from one to seven or more.

Habitat.—North of San Francisco Bay as far up as Oregon. Very common in the vicinity of Santa Rosa, etc., especially in heavy moist, and rich clayey soil. The most common earthworm of the region. This species was first found by Miss A. Eastwood of California Academy of Sciences.

ARGILOPHILUS MARMORATUS PAPILLIFER n. sp. The ventral region of the genital somites and posterior to the clitellum furnished with a single row of median intersegmental papillæ, varying in number up to seven or eight or more. The papillæ are generally longer than in the preceding species. Although I have examined hundreds of specimens I have never seen any transitions between these forms. If the papillæ in these subspecies were of constant number I would not have hesitated to pronounce them as equal in importance as species characteristics to the tubercula pubertatis in the true Lumbricidæ. The great variability in the number of the papillæ, however, place them in a somewhat different light, the only constancy of outward character being that in one form they are paired, in the other median. In the paired form they are situated one on each side of the ventral ganglion, while the median ones are situated directly under the ventral ganglion, one or one pair in each segment.

Habitat.—This form is, so far, found only south of the region inhabited by the former. I have specimens from Berkeley, San Joaquin Valley, Monterey, San Francisco, Palo Alto, etc., but only one single specimen from Santa Rosa, where the former form is most abundant. The species prefers very heavy adobe soil, and occurs only in the richest ground, never in poor soil. The occurrence of Argilophilus is always a sign of the fertility of

the soil. A single specimen of what appears to be a new species of this genus was brought by Mr. Louis King from Portland, Or., but being very badly preserved I must leave its description for some future time.

CONTRIBUTIONS TO WESTERN BOTANY. No. 5.

BY MARCUS E. JONES.

REVISION OF THE AMERICAN SPECIES OF AQUILEGIA NORTH OF MEXICO.

In studying the species of this genus a person is struck with the amount of labor wasted in describing them, and the uncertainty attaching to the species recognized. This is due largely to the multitude of characters belonging to the genus that are not given in any book and which most people do not know are generic. The really specific characters are few. There are two distinct lines of species in the genus so far as our western ones are concerned, which hybridize among themselves and possibly with each other. One line has petal-limb dilated above and flowers never truly red; the other has petal-limb not dilated above and red or reddish flowers. The following gives my views of this genus, though I am inclined to think that further research may prove that *A. flavescens* will become a variety of *cærulea*, *A. formosa* a variety of *A. Canadensis*, while the margin between *cærulea* and *chrysantha* is very slight.

AQUILEGIA L. COLUMBINE.

Parts of flowers in fives (except stamens) petal-like, alternate, stamens many. *Sepals* narrowed at base into a short claw and bent at base, usually acute, equaling the limb of petal or longer, widely spreading or reflexed, rather veiny, often green-tipped and simulating a gland. *Petals* either saccate at insertion or prolonged backward into hollow, usually tapering spurs which are short to four inches long and with a nectary in the tip set obliquely on the spur; limb of petals either almost obsolete or nearly equaling the sepals, usually rather thick, erect, and yellow, or sometimes white at least at the tip. *Stamens*

separate, many, an inch or less long, erect except in the first stages; anthers yellow, elliptical to oval, and usually obtuse at both ends, basifixed, one-half a line or less long, wider after bursting, filaments yellow and filiform at apex, white and enlarged and scale-like at base; next the ovaries is a sheath of sterile filaments which are enlarged throughout, nearly equaling the others, lanceolate, ridged, corrugated and white. *Ovaries* five, erect, closely aggregated, linear-cylindric, densely white-pubescent with glandular hairs up to the glabrous, filiform, persistent styles (two to four lines long) which with the ovaries are a trifle shorter than the stamens in flower, but the rapid development of the ovaries soon thrusts out the styles; stigma very small and capitate. At maturity the carpels lengthen to about an inch (half an inch in one case) and are linear, straight, but bent outwards at tip, cross section obovate, opening along the inner side from the oblique tip down, sparsely glandular-hairy, reticulated; seeds many, in a single row, horizontal, obliquely obovate cylindric, a line long, rounded on the back, with sharp inner edge, very black, smooth and shining when fully ripe, but less mature ones are brown. *Flowers* paniculate, racemose, or in one species single, the main stem sending off, usually above the middle, three to five branches remotely, each branch being subtended by a single leaf, branches a foot or less long, and lower half naked while the upper half has one to three flowers or rarely is again branched with one to three flowers on each branch, flowers terminal and centrifugal (central one blooming first). *Peduncles* usually with leafy bracts at base, and central one often with two in the middle, peduncles one to four inches long, more or less bent, but erect in fruit, longer than the flowers, glandular hairy. *Roots* perennial, fusiform, thick, with many short stout spreading branches at the top which are covered and much thickened with closely imbricated and old leaf sheaths. *Stems* tufted, erect, bent at base, tall (except in two species), usually leafless below, especially the lower third. *Leaves* with short, ridged sheaths one-fourth to an inch long; root leaves biternate (triternate in one species and with petiole absent in another), many, petioles long, generally about one-third the length of the stems; primary divisions of petiole two to four

inches long, secondary ones an inch long, or even all but the central one absent; leaflets irregularly two to three-lobed and the lobes entire to three to five lobed or toothed, and teeth rounded and blunt, leaflets obovate, cuneate, or broader, one-half to two inches long, seldom pubescent, glaucous or paler below; lower stem leaves similar with shorter petiole; upper stem leaves without a petiole; uppermost leaves reduced to simple or three to five-lobed usually leafy bracts which are usually acute; the development of the stem leaves depends upon the exposure inversely. The whole plant except the leaflets is covered with a glandular hairy pubescence which is scarcely visible at times and at others is very pronounced, but is of no specific value. It is most pronounced on the peduncles and young pods, and is more evident above. The genus frequents open woods in the East, and stream banks and moist mountain sides at rather high elevations in the West.

* *Limb of petal somewhat dilated above, oblong to rhomboidal, large, at least half as long as the sepals, and about equaling the stamens, flowers not red. Petals rounded, truncate or emarginate.* § *Dilatæ.*

+ *Stems tall, often three feet high, nearly glabrous below; sepals acute, spreading, rather thin, nectary small.*

++ *Spurs long, straight, slender, two to four inches long, not shorter than sepals, nectary very small, apparently abortive; flowers large, one and one half to four inches wide, ascending; limb of petal four to six lines wide, six to ten long or even more.*

A. cærulea, James. Sepals white or lavender, lanceolate to broadly ovate, one to two inches long, occasionally tinged with pink or yellow; flowers two to four inches wide, petal-limb six to eight lines long, white to deep cream yellow, sepals and petals both frequently veined with blue, fragrant.

Abundant in Colorado at middle elevations 7000 to 11,000 feet altitude in all the mountains, mostly on moist mountain sides; very abundant in the Wasatch and Uintas at 8000 to 10,000 feet altitude and therefore subalpine, also in the Pine Valley Mountains in southern Utah; less abundant south and

west in the other ranges, also Mt. Ibapah in the Deep Creek Mountains, Jeff Davis Peak and the Schell Creek Mountains in eastern Nevada at high elevations, and probably in the East Humboldt Mountains; rare in Nevada and the Sierras of California, also northward to the Arctic regions. Much esteemed in cultivation where it is bluer.

A. chrysantha, Gray. *A. leptocera* var. *flava* Gray Pl. Wright 2, 9. *A. chrysantha*, Gray Proc. A. A. S., 8, 621. Flowers golden yellow throughout, one to two inches wide, spurs much longer than the sepals and very slender; sepals lanceolate, less than an inch long; petals as above.

Lower elevations 6000 to 8000 feet altitude in Colorado, and higher altitudes southward to 10,500 feet in Arizona. Rocky Mountains of Colorado from Colorado Springs south through New Mexico and Arizona. Not yet known in Utah. This appears to hybridize with *cærulea*, the flowers being yellow or tinged with blue and spurs shorter. Should it become necessary to recognize the varietal name, this will become *A. flava* (Gray).

A. longissima, Gray. Flowers yellow, spurs filiform, four inches long, and of about the same width throughout, petals nearly equaling the lanceolate sepals, elongated-spatulate. May be a form of the above.

Northern Mexico, *Palmer*.

++++ *Spurs short and thick, six lines long or less, somewhat hooked at the end, not longer than the small sepals, nectary large, flowers small, not even an inch wide and often very small, nodding or ascending, yellow, but often tinged with red or blue.*

A. flavescens, Watson King's Rep. 5, 10. Sepals lanceolate to oval, six to eight lines long; petal-limb somewhat dilated, about equaling the spur and nearly as long as the stamens, four lines wide, anthers elliptical-oblong, when the flowers are very small all the parts are small in proportion, except the stamens, which remain the same. All but the leaves often pubescent.

Six thousand to nine thousand feet altitude along streams in very wet, exposed, and boggy places, rarely at high elevations, most abundant at low elevations, cañons of the Wasatch from

central Utah northward to British America. It also occurs in the Uinta Mountains, but does not seem to exist in Nevada or westward. June to August. At high elevations it hybridizes with *A. cærulea*, the flowers being intermediate in size with shorter and stouter spurs than *cærulea*, whitish or tinged with blue.

+- +- *Stems very short or none; flowers blue, small, one-half inch wide or less, spurs somewhat hooked, two lines or less long, shorter than the limb of the petal.*

A. brevistyla, Hooker. Flora Bor. Am. I, 24. Stems six inches high or less, densely tufted, not surpassing the leaves, stem leaves petioled and scarcely differing from the others, pedicels two to three inches long, very slender; sepals oval and very obtuse and green to lanceolate, acute, and colored, four lines long, three lines wide; limb of petal oblong, yellow, a little shorter than the sepals and a little longer than the stamens; carpels about an inch long, and styles in fruit two lines long, anthers narrowly oval and very small.

High Alpine regions in meadows, Colorado and northward to the Arctic regions. Not seen in Utah or westward.

A. Jonesii, Parry Am. Nat. 8, 211. Named for Captain Jones. Monocephalous, peduncle two to three inches long; leaves all crowded and common petiole absent or nearly so; leaflets small, obovate, entire, nine; spur almost obsolete. Probably a form of the above.

Summit of Phlox Mountain, Wyoming.

* * *Limb of petal not dilated above, usually with a very short, triangular tip or narrower, styles four lines long, flowers red, rarely yellow, at least the tip of the limb of the petal yellow or white, acute to nearly truncate, sepals acute, stamens usually much surpassing the petals, spurs rather stout, generally somewhat hooked, nectary large, flowers nodding, one to one and one-half inches wide, tall plants.* § *Rubescentes.*

A. Canadensis L. Spurs one-half to twice longer than sepals, three-fourths to one inch long; sepals ovate one-half inch long; petal limb oblong to nearly square, four lines long, two to three

lines wide, nearly truncate; anthers elliptical, one-half line long. Upper leaves scarcely bract-like.

Open woods in the Eastern States. Seems to occur from Arizona to British America, in the Rocky Mountains rarely, at 8000 feet altitude or higher, but all these forms may be the next if it is distinct which is doubtful. Also in the San Francisco Mountains, Arizona Jones. May hybridize with *cærulea*.

A. formosa. Fischer, DC. Prod., 1, 50. Stout spurs about equaling the ovate sepals, five lines long, reflexed or widely spreading; petal limb three lines long, as long as broad, narrower at apex; stamens an inch long; anthers narrowly oval. Probably a form of the above, though the spurs are shorter and the upper leaves are more bract-like.

Along streams near the bases of the mountains, in cañons, 6000 to 8000 feet altitude. Said to exist in Colorado, frequent in western Utah, Nevada, and northward to British America, also Oregon, not found in California.

A. formosa, var. *truncata* (Fischer & Meyer), *A. truncata*, F. & M. Ind. Sem. Petr. Supp. 8. Differing from the above only in the limb of the petal being reduced to a rudiment. Intermediate forms seem to occur.

Along mountain streams at middle elevations in California and northward. May hybridize with *A. cærulea*.

* * * *Spurless; leaves triternate, flowers white or pink. Peduncles very long.* § *Pseudaquilegia.*

Aquilegia ecalcarata, Eastwood, Zoe ii, 220, two feet high, very slender, stems inclined to be glaucous and whole plant minutely and sparsely glandular pubescent; leaflets distant and few, on capillary stalks, sharply cuneate at base, thin, an inch long, veiny; peduncles four to six inches long, very slender, erect; bracts lanceolate-ovate, three lines long, entire; flowers three-quarters of an inch wide, parts delicate, thin; sepals closely and parallel veined, lanceolate, acute, spreading; petals the same as sepals but more delicate, and barely saccate at base; stamens just equaling the petals; anther very small, narrowly oval; styles barely pubescent at base, longer than usual; ovaries minutely glandular pubescent when young, when mature almost

glabrous; pods one-half inch long, delicate. The peduncles are almost glabrous, and the stem leaves have the petiole reduced in my specimen to a sheath.

Damp alkaline soil under shaded cliffs in S. W. Colorado June to July. Found first by Mr. Alfred Wetherill then by Miss Eastwood.

NOTES ON TOWNSENDIA.

This genus has always been a trying one to me because the descriptions have not fitted the plants as they grow. It now becomes evident that the trouble has arisen from the undue emphasis which Dr. Gray gave to the pappus, this being of almost no value. The glochidiate hairs seem to hold but there is one species in which there seems to be a transition in that respect. Although several species are said to be annual I have never yet seen a specimen that I would swear was an annual; most of these seem to germinate in the fall and put out a few leaves, while those said to be winter annuals are doubtless biennials; most of those said to be biennials are at least three years old, while few of them endure over four years, except perhaps *T. Fendleri*. All are early bloomers, for the altitude in which they grow, except *T. Fendleri* and even that may begin to bloom early but continues till frost.

Taking the order of Gray, *T. eximia* and *T. grandiflora*, Nutt. have glabrous rays. An interesting form from Labron, Colo., August 30, 1873, by Greene, has heads smaller than those of *T. eximia* and is diffusely and intricately branched, rigid, only minutely pubescent, with the scales and habit of *T. eximia* and the pappus of *T. grandiflora*. This is in the Herbarium of the California Academy. It may be a hybrid.

T. Parryi, Eaton. There are some points omitted from the description of the type by Gray. The leaves are acute, one-half to one and one-half inches long of which the blade is one-half and the petiole is slender; heads ebracteate; peduncle thickened above; scales ovate to lanceolate, soft and thin, scarious except midrib, acute, closely imbricated with no evident ranks but the outer successively shorter, not acuminate; heads six lines high; rays one inch long. This has widely lacerate scales, and is evidently a short lived perennial. From the type in the Herbarium

of the California Academy. This simulates *T. grandiflora* very closely but a specimen collected by Tweedy in May at a place in Gallatin County, Montana, tends to connect it with *T. florifer*. The heads are larger, and stems two to three inches high, spreading, lax; leaves spatulate, obtuse, and like those of *T. scapigera*. It is separable from *T. florifer* only by the perennial root, and the scales. The pappus of disk and ray are equal, and the ray is glabrous.

Townsendia florifer, *scapigera*, and *Watsoni* are manifestly much confused. The first was originally described as a perennial and is certainly a biennial at least, the second was described as perennial and is manifestly such but blooms the second year, the third is not a good species unless it covers many things referred to the first and the second by Gray, while its real character, a winter annual seems to have been overlooked by Gray or confused with the others.

Townsendia florifer (Hook.) Gray, as I understand it, is confined to Oregon, Washington and northwestern Nevada. It is a little ashy, but the leaves are usually nearly glabrous, and thick as though succulent; involucral scales about one-half as many as in *T. Parryi*, and definitely separable from that species only by the scales, which are green and ashy and much less imbricated; stems spreading, two to four inches long; leaves spatulate to linear-spatulate, shortly apiculate, the blade as long as petiole; heads one-half inch high and three-fourths inch wide; pappus equal in all the specimens I have seen. This is drawn from specimens in the California Academy from Washington, *Brandegee*, *Howell;* Virginia City, Nevada, *Brandegee*. Another form from Walla Walla by Mr. Brandegee has linear-spatulate leaves, acute, one to two inches long, and solitary heads on stout, leafy peduncles, which are ascending, and four to five inches long, rarely branched in the middle; whole plant ashy strigose to the scales; heads one-half inch high and very many. All the above forms are biennials. The rays are rough with yellow sessile glands on the outside. The plants seem to be confined to the valleys at low elevations, but may ascend the lower slopes of the mountains.

Townsendia scapigera, Eaton, so far as I know it, is rare. If all the plants which have been referred to it belong with it, the range is at least from southern Utah and northward to Idaho and westward to California, in the mountains at low elevations; *i. e.*, not alpine. Taking the type as given by Eaton in Bot. 40th, Parallel 5, 145, Fig. 17, my material from McIntyre's ranch, Utah, May 18, 1891, at 7000 feet altitude, corresponds with Eaton's type exactly, except that the plant is densely matted (surely perennial); leaves very narrowly linear, a little widened at apex, heads many and sessile, one-half inch high, three-quarter inch wide. Other characters not given by Eaton are that the rays are a line wide; lead-purple in the centre and with white margins, half an inch long, pubescent with white, rarely yellow, atomiferous gland-like bodies on the outside, rather firm in texture; leaves strigose and rough, thickish.

My material from Deep Creek, Utah, June 6, 1891, altitude 5500 feet, is the same as the above, except that the rays are only three lines long, and the leaves are spatulate and hoary strigose; plant two years old. My material from Schellbourne, Nevada, July 13, 1891, at 8000 feet altitude, is certainly three years old, and the same as Eaton's type, but closely branched; inner scales linear oblong, mostly acute, hyaline margin narrow; peduncles barely surpassing the leaves; very minutely pubescent; rays pubescent as in the above. My material from Wells, Nevada, is certainly perennial in small mats, whole plant white and rough with stiff hairs; peduncles with several bracts; scales linear, simply acute, sparsely strigose, lacerate margins rather wide; otherwise as in the type. The first form given under this species would be at once taken for *T. sericea*, but it is not that plant.

Other forms that may eventually prove to be *T. scapigera* I have given the provisional name of *T. montana*. To all appearances they make at least one good species. The type is a specimen from Alta, Utah, collected above the Flagstaff mine at about 9500 feet altitude, and therefore subalpine or alpine growing on rocky mountain sides. Loosely matted from a root at least three years old; leaves one and one-half inches long, blade oblanceolate and half the whole, nearly glabrous, but petioles rough with short hairs and under the microscope the blades are sparsely

pubescent, leaves fascicled at the top of the short branches of the root; heads one-half inch high, almost sessile and surpassed by the leaves, peduncles not lengthening with age; scales narrowly oblong, the outer the narrower, rounded at apex, the hyaline and lacerate margin narrow, midrib green; scales in about five ranks and the outer very short, inner scales one and one-half lines wide and shorter than the pappus; rays three lines longer than the disk, purple, three-quarter line wide; pappus alike and akenes glabrous; rays glabrous or nearly so. Another specimen which I refer to this I collected above Silver Lake in American Fork Cañon, Utah, July 30, 1880, at about 10,000 feet altitude, which is the same as the above, except that it is at least four years old and more loosely branched and leaves only an inch long. The inner scales are acute with rather wide lacerate margins, outer scales short, scales in at least three series; heads sessile. The glabrous akenes and habitat would indicate a distinct species.

Townsendia Watsoni, Gray. If Dr. Gray has not confounded this with the true *T. florifer* then this is not a good species. In order to find out I had two plants which I knew grew from the same seed sent to Harvard, one of them came back labeled "*T. florifer*" and the other "*T. Watsoni*." It is therefore evident that the varying pappus was considered a specific character by Dr. Gray and was used to separate the species, but it is of no value whatever in this group and is hardly of any value in the genus at large. From quite an amount of material from the northwest it seems likely that there may be some good characters left on which to separate the species, the chief one being that the true *T. florifer* is biennial or more, while our plant of Utah and most of Nevada is a winter annual, almost white with a rough strigose pubescence which is short or long, the scales are in about two ranks; rays very pubescent on the outside with flattened hairs with yellow gland-like tips. Our plants are never fleshy and the leaves are not thick. It is a more graceful plant, and grows in the valleys in very dry places and is an early bloomer, it soon dries up and blows away. It is the plant referred to by me in "Contributions No. 3" as being a diurnal with flowers opening between nine and ten o'clock A. M., and closing between five and six o'clock P. M. It is the only *Townsendia* of our

valleys and abounds in western Utah and eastern Nevada at elevations from 4300 to 5500 feet. If these distinctions given to uphold the species fail, then this species cannot be maintained.

Townsendia sericea Hooker. A form of this in the Herbarium of the California Academy collected by Greene in New Mexico, locality not given, has the scales of *T. Rothrockii* and the pappus and leaves of *T. Wilcoxiana*, tending to confirm a suspicion which I have long entertained that these two species are only sports of *T. sericea*, and are not valid. A form collected by Miss Eastwood at Mancos, southwestern Colorado, June, 1891, shows an approach to *T. incana*. The rays of *T. sericea* are glabrous.

Townsendia incana, Nutt. As I have already indicated *T. Arizonica* is a form of this species, being separable only by the pappus a worthless character. In looking over my material from Milford, Utah, 1880, and named by Gray himself, I find that the pappus of the ray is often one-half that of the disk and the heads are often short peduncled with all sorts of transitions between, the rays are glabrous except very minute atoms scattered over them. True *T. incana* usually grows in smaller mats in lower elevations and has the rays pubescent with flattened hairs which are tipped with yellow gland-like enlargements. It is very common in the Sonoran region of eastern Utah and southwestern Colorado, and blooms in May and June. An interesting form of this species is—

Townsendia incana Nutt. var. *ambigua*, n. var. This would suggest *T. grandiflora* in some things. Short-lived perennial but blooming the second year; leaves spatulate, acute, gradually narrowed into a long petiole one to one and one-half inches long; heads ebracteate, from sessile to peduncled, peduncle being sometimes three inches long, one-half inch high or more, one-half inch to an inch wide; bracts in two to three series, acute. In all the specimens which I have seen, the pappus is in the ray flowers less than one-third that of the disk flowers, of single scales that are very narrow and bristle-like; otherwise exactly as in the species, except that it is less branched than the type. Common with the type in the same region as the type. It blooms from the middle of April to June. Collected

by myself in several localities in 1891 and in the same region by Miss Eastwood in 1892.

Townsendia glabella, Gray. This plant seems to have been collected but very little. Miss Eastwood sends it from Mancos, Colorado, collected in June, 1892. Her plants are perennials in a dense cæspitose tuft; bases of leaves villous otherwise glabrous, leaves spatulate to oblanceolate, acute, blade one-half to three-quarters inch long, two to three lines wide equaling the petiole; heads four to five lines high, on a naked peduncle one-half to one and one-half inches long; scales in two series the outer ones a little shorter and four to six in number, the inner six to eight, all lanceolate, acute (not acuminate) greenish at tip and with narrow hyaline margins; rays purple and glabrous; outer pappus one-quarter the inner; root not slender.

Townsendia strigosa Nutt. The usual form of this plant is a very pretty winter annual with glabrous rays, but one form collected in Wyoming at Church Buttes, July, 1873, seems to be a short-lived perennial. It abounds in the higher Sonoran region of eastern Utah and adjoining Colorado, and is abundantly distinct from *T. Fendleri* or any other species which I know. It does not exist in the mountains which are the home of the allied *T. Fendleri*.

Townsendia Fendleri, Gray. As I understand this species it is a summer bloomer continuing till frost, it seems to begin at a little below 6000 feet altitude and continues to at least 8000 feet. It is confined apparently to the mountains of south central Colorado and New Mexico, being found as far west as Glenwood Springs (Miss Eastwood). The stems are tall strigose and rough and usually decidedly perennial, though it blooms the second year. It is at once recognized by the narrow leaves, very rough pubescence, and much branched habit. The rays are glabrous.

NOTES AND NEW SPECIES.

Thelypodium elegans, n. sp. Biennial, two to five feet high, erect, slender, simple, or branched at the base often; glabrous except racemes and stems, at least the lower ones and rarely the young pods sparsely pubescent with long tangled wool; lowest

leaves oblanceolate, contracted into a broad margined petiole, usually finely denticulate but sometimes coarsely dentate, obtuse, lower stem leaves oblong-lanceolate and denticulate at apex, auricled, upper stem leaves lanceolate and the uppermost ovate, acute, broadly auricled, reduced; racemes one to two feet long, close, wand-like; pedicels five to eight lines long, ascending, rarely horizontal in fruit, slender in flower; sepals narrow, two to three lines long, obtuse; petals white or tinged with purple, four to five lines long, oblanceolate to oblong-obovate; anthers curved and always partly or wholly exserted; flowers usually one-half as long as pedicels; pods one-half a line wide, three inches long, generally spreading at an angle of 45°, occasionally bent in an arc downwards, but no specimens with pods all arched, pedicels never reflexed; stipe a mere rudiment; beak one to three lines long. This is a close congener to *T. ambiguum*, but pods stipeless, beaked, lower stems always pubescent, flowers much smaller and nearly white, and pedicels longer. A form from Green River Utah, that I refer to this species is simple stemmed and with appressed pods.

Westwater, Colorado, May 7, 1891, also adjoining Utah. Common on the adobe plains of the desert.

Caulanthus crassicaulis, Watson var. *glaber*, n. var. glabrous throughout. Otherwise exactly as in the species. Type from Summit near Sink Valley, S. Utah at 7000 feet altitude June 23, 1890. During the present year I have seen this occasionally in eastern Nevada along with the species. It is quite striking but passes into the type.

Lepidium montanum, Nutt. var. *alyssoides* (Gray Pl. Fend. 10). It is so manifest that this is only a more enduring form of *L. montanum* that it is useless to keep it up as a species longer. It passes by insensible gradations into the type.

Lepidium Utahense, Jones in Herb. This is the plant which Watson wrongly referred to *L. montanum* as a form of his var. *heterophyllum*. It was first published by me in my lists of the Flora of Utah collected in 1880 and published early in 1881 but without a description. In the thirteen years which have elapsed since, I have never seen anything to change my original opinion,

though at the time I deferred to his opinion. The plants were collected at Milford, Utah, June 23, 1880, at 5000 feet altitude, in alkaline meadows, being just in flower. Perennial from a deep, large, fleshy, erect root which is often divided at the apex into many dense crowns, the crowns are covered with many stiff dead leaf petioles and with some rosulate new leaves which are two to three inches long with margined petioles a little shorter than the narrowly elliptical blade which is entire, fleshy, barely acute at apex and cuneate narrowed at base; stems erect or the outer ones ascending, twelve inches or less long, simple, purplish at base, glabrous throughout even to the pods except a very minute pubescence on the upper stem which is denser on the pedicels and sparse on the sepals and long; stem leaves one to two inches long, fleshy, entire, barely acute, broadly linear, a little contracted at base but hardly petioled, not at all clasping nor auricled, one-half longer than the internodes, many, scarcely shorter above; spikes short, one to two inches long, sessile or nearly so in fruit, a mere head in flower; pedicels rather stout, short in flower, in fruit ascending but tips usually horizontal, three lines long, round, but with a ridge on either side and so seeming flattened, a little thickened at apex; sepals green, oval, very concave, rounded and hyaline at apex, three-quarter line long, often sparsely long-hairy; petals obovate one and one-half lines long, white; stamens apparently two with large oval anthers half as long as the stout filament, just equaling the short stout style; pods two lines long and a line wide, seeming acute at each end but minutely notched at apex, flat, not winged, elliptical, not corrugated, the two nerves very prominent and raised into a very narrow wing in the middle of the pod, of the same width as the style and seeming to be a prolongation of it; style one-third line long and much longer than the minute notch; pods erect and so at right angles to the apex of the pedicel. Distributed as No. 1821 of my Utah sets.

Astragalus pephragmenus, n. sp. Nearest to *A. glareosus;* referred to *A. Shortianus*, var. *minor* Gray. Perennial, matted from a much branched woody root, stems one to four inches long, spreading on the ground; stipules large and scarious, triangular, very slightly connate below, adnate to the petiole; whole plant

even to the pod shortly villous tomentose; leaves about four inches long, the petiole being one-third of it; leaflets eight to fifteen pairs, oval to elliptical, four lines long, greener above; peduncles including the rachis of the short spike equaling the leaves, stout, sulcate, ascending; bracts three lines long, ovate, scarious; flowers nearly sessile, six lines long, light purple, six to ten in a close raceme or short spike; calyx woolly, four lines long, teeth one-third the tube, subulate; keel two lines longer than the calyx and teeth, barely acute, incurved to one-third circle, purple tipped; wings about the same length as keel; pod an inch long, oblong, nearly straight, base rounded and jointed to a very short stout stipe one-third a line long, apex prow-like and abruptly acute (like *A. Preusii*), dorsal suture very slightly impressed, very narrow externally, ventral suture very thick externally, not impressed but pod often slightly bisulcate ventrally, suture one-half a line thick externally and widest in the middle of the pod; pod one-celled, three lines wide, very thick walled (one-twentieth inch thick in the dried specimen), inner wall dense, outer spongy; pod wrinkled longitudinally and obscurely so transversely; pubescence of pod minute but rather close and tomentose; hairs of the plant very slender, attached by the base and nearly smooth. This plant at once suggests *A. glareosus*, *Missouriensis*, and *Shortianus*, but differs from them all in apparently good characters. I doubt if any connecting forms have ever been known that would place this as a form of *A. Shortianus*.

This was gathered on the summit of the Pinal Mountains, Arizona, May 26, 1890 in rocky places. I have been inclined to place it as a form of *A. Chamæleuce* and the latter plant I think is the same as *A. glareosus* the older species, but I now regard it as a good species. It is in my sets recently distributed.

Astragalus Purshii Douglas. The very imperfect description of this plant given in Flora N. A. T. & G. is manifestly the type as it exists in the great region which it covers, but there are two errors in the description, the flowers are not one and one-half inches long and they are not yellow. Others have followed the same error as to color of the flowers, being led astray by the color in the herbarium and by old flowers; the flowers are white

when fully developed and as they fade or become old they turn to a rich cream color. I have never yet seen a truly yellow flower even in a herbarium specimen. It is one of the earliest spring flowers, coming out along with *Cymopterus montanus*, and is out of bloom in a month or less. I will give a detailed account of field studies on this plant in a later issue.

Through the kindness of Miss Eastwood and Mrs. Brandegee I have been enabled to examine all the material of the *Eriocarpi* in the Herbarium of the California Academy. Of *A. Purshii* I have seen material from Wyoming, Washington, and the Sierras as far south as Tehachapi and Tejon Mountain, California.

Astragalus Purshii, Douglas var. *tinctus*, n. var. leaves very broadly obovate, small; flowers purple, otherwise as in the type.

Edgewood near Mt. Shasta and also in Ventura County, Cal., Brandegee; Olanche and Keeler, Inyo County, Cal., Brandegee; the former also by Miss Eastwood, Soda Springs, Nevada County, Cal., 1882 Jones, and an intermediate form June 16, 1882, Austin Nevada, Jones. This seems to belong to western Nevada and the Sierra Nevada region. It should be remembered that the type of *A. Purshii* is stemless.

Astragalus Purshii, Douglas var. *longilobus*, n. var. Calyx lobes filiform nearly equaling the keel; peduncles as long as the leaves; otherwise as in the type. Tehachapi, June, 1884, Brandegee; Aurum, Nevada, May 4, 1893, Jones (not in fruit). Also Tanesville, Cal., June 30, 1892, Brandegee. This has very long stipules and pod of *A. inflexus*, but the woolliness of *A. Purshii*. Connecting forms occur, but as yet I have seen no specimens which I could not at once separate from *A. inflexus*.

Astragalus inflexus Douglas. A plant in the Herbarium of the California Academy by Canby from Washington, 1883, has a stem six inches high, with six leaves or joints from a closely branched root; whole plant white with long and very fine hairs, having a floccose appearance, but the hairs are not much tangled; stems zigzag; proper petiole an inch or less long; stipules and bracts the same as in *A. Purshii*, but usually wider; six lines long, hyaline, tapering from base to a fine, threadlike point; leaflets ten to fifteen pairs, elliptical, six lines long, sharply apic-

ulate, at least the most of them, acute at base and a little cuneate; nodes of stem shorter than the leaves, which are three to four inches long; naked part of peduncle as long as the leaf, erect; flowers racemose, few; fruiting pedicels one to one and one-half lines long; calyx hyaline, not much inflated, cylindrical, tube five lines long, teeth nearly the same and almost filiform except at short triangular base; blade of keel two lines long, purple tipped, very long clawed; wings a little longer than keel, and banner a line longer than wings; flowers not large and probably white; pods ascending, short-stalked and jointed at tip of stalk, as in *A. Purshii*, the stalk being one-third to one-half a line long and stout, pods simply shaggy as in *A. malacus*, fleshy, finely wrinkled, usually bent into a half circle, three lines wide, one to one and one-half lines thick, much obcompressed till the sutures nearly meet, with a very broad, shallow sulcus above and below, point of pod sharp but scarcely flattened; seeds rather large, a line long; pods cartilaginous.

Two forms which I refer to *Astragalus Utahensis* T. & G. in the Herbarium of the California Academy are one from Candelaria, Nev., by Shockley, with flowers and peduncles of this species and the pubescence less woolly and stems not branched; and one by Brandegee from Pyramid Lake, Nevada, which is this species, but the pubescence is more that of *A. Purshii*.

*Astragalus leucolobus.** This is a specimen from Mr. Parish in my herbarium labeled "Watson"; if it has been published I do not know it. The plant is many-stemmed from a somewhat woody root and stems short, one to two inches long and decumbent; nodes shorter than the large, triangular, acute, hyaline, free stipules; peduncles four to five inches long, ascending, rather stout, three to five-flowered at the tip, and with flowers close together; bracts hyaline, broadly ovate to lanceolate, acutish, one to two lines long; pedicel almost none; flowers nearly horizontal, purple but lighter below; calyx cylindric, three lines long, one line wide, inclined to be narrowed at apex, base oblique; teeth very short, triangular, one-half a line long, erect;

* It is probable that *A. leucolobus* is a clerical error for *A. lectulus* Watson Proc. Amer. Acad. 22, 472, as the description there given accords with the plant under consideration.

keel gently bent at tip into an arc of a circle, blade two and one-half lines long, less than a line wide, obtuse; linear wings barely surpassing keel; banner a little longer than wings and ascending; flowers about three lines longer than calyx, and calyx scarcely deeper cleft above and but little inflated; pods immature, but apparently about the size of *A. Purshii*, but base nearly straight and apex hooked, thin, sulcate dorsally one-half a line deep, cross section probably obovate-cordate, apparently very shortly stipitate in the calyx, white with a dense, very short pubescence. The leaves are two to three inches long, of about ten leaflets, which are close set, three lines long, elliptical to oval, obtuse; petiole one to two inches long; whole plant hoary with close, fine, short hairs. This has the look of *A. Utahensis*, but with shorter and stouter flowers and longer peduncles. It may not belong at all to the *Eriocarpi*, but its true position cannot be made out without mature pods. Collected by S. B. Parish in Bear Valley on San Bernardino Mountain, Cal., June, 1892.

To this I refer a specimen collected by Miss Eastwood on Cantua Mountain, Cal., May 19, 1893. It either belongs here or is a new species. The nodes are a little longer, short stems much branched; leaflets two lines long, oval; pods shaggy with dense long hairs as in *A. Utahensis*, hooked at the end as in this species; whole plant shaggy and hoary; pods immature. Manifestly closely allied to *A. Utahensis.*

Astragalus lentiginosus, Douglas. To this species I have referred with some doubt a plant sent by Mr. Brandegee from Lone Pine, Cal., May 16, 1890. It has the long peduncle of the var. *Fremonti*. The calyx is oblique and like that of *Hedeoma Drummondi*, a line long with lobes as long and subulate, cleft deeper above, hoary with white appressed hairs, flowers and pods horizontal; keel abruptly incurved to more than 90°, a line shorter than the ascending, linear-oblong wings which are rounded at apex, light purple; banner light purple, a line longer than wings, nearly erect, large, sides reflexed; peduncles four inches long, longer than the leaves, ten to fifteen-flowered above the middle, racemose; pods congested, oval, abruptly short-pointed, three-quarters inch long, one-half inch wide, papery, glabrous, or very minutely pubescent when young;

lower leaves small, upper the largest, these are oval to obovate, obtuse; stems many, erect, leafy.

I can see no character to surely separate this species from *A. diphysus* Gray, and it is not at all certain that it is distinct from *A. Coulteri*.

Astragalus lentiginosus Douglas. A plant collected at Alcalde, Cal., 1890, by Mr. Brandegee would fall under the variety *Fremonti*. It is evidently perennial, one and one-half feet high, erect, whole plant tomentose-canescent, sparse above; calyx densely black-hairy, cylindric-campanulate, three lines long, a line wide, teeth one-third the tube; flowers ochroleucous, five lines long; peduncles a little surpassing the leaves, densely flowered; pods very shortly stipitate and jointed at tip of stipe, sparsely hairy; leaflets about ten pairs, obovate; no petiole above.

Astragalus latus (*A. diphysus* Gray var. *latus* Jones, Zoe iii, 287). It is manifest that this is a distinct species as I have had a chance to study it this season from the beginning of its development to the end. It forms a loose mat on the ground, which is from one to two feet in diameter, the stems are short and the leaves long, the peduncles only half as long as the leaves and so the flowers are hid among the leaves, calyx thickened at base and the lower side the longer but straight, hyaline, white, sprinkled with minute black hairs, four lines long, one and one-half lines wide and a line thick, not bent nor uneven in width, cleft deeper above, teeth unequal, subulate, about a line long, inclined to spread; banner usually with sides not reflexed, ovate, four to six lines wide in the middle, bent abruptly at tip of calyx teeth at an angle of 45°, six lines longer than calyx, deeply notched at tip, thin and not thickened at base, light pink-purple, occasionally the outline of the banner is oblong, triangular or even fiddle shaped by the varying position of the sides; sulcus conical, and very small at its apex the tip of the keel; white spot obovate, cut up by radiating purple veins, reaches within one and one-half lines of the tip; wings narrowly oblong oblanceolate to broadly oblanceolate, rounded at apex which is often considerably enlarged, minutely notched on the lower side near the apex, one and one-half lines longer than the keel and purple at apex and lighter below, ascending 45°, concave to keel and

spreading at tip; keel straight, with tip incurved a little more than 90°, obtuse, purple at tip, exceeding calyx teeth by two and one-half lines; pods mottled, colored, or plain, sessile, very acutely long or short-pointed with incurved tip, much inflated, broadly to narrowly ovate, inclined to be retuse at base, cross section round or a little wider laterally, sulcate ventrally nearly to the middle and the contiguous sides not adherent, sulcate dorsally to beyond the middle so that the sulci meet but there is no septum between even when young, though the parts adhere, with age they separate, the contiguous sides of the dorsal sulcus adhere when young forming a false septum so that the pod seems to be only slightly sulcate dorsally, but as the pod matures the sides separate and so it becomes didymous, apex of pod not two-celled; mature pods chartaceous to membranaceous, immature pods slightly pubescent within with wall one-fortieth inch thick. Neither peduncles, stems nor petioles perceptibly sulcate; stipules adnate, triangular, not small, ciliate and inclined to be lacerate on the edge, acute, lower not larger; flowers loosely short spicate; peduncles none to four inches long; flowers three to ten; pods prostrate as well as the flowers; whole plant very glabrous. This is a mountain plant coming down the cañons to 7500 feet altitude, grows on loose, gravelly places by the roadsides and is not abundant; it never grows in alkaline places. The pods are destitute of any internal sap at all times. It begins to bloom about May 1, and continues for a month; the pods are mature by the first of July.

By way of amplification of what I have said about the confusion in species of the *A. lentiginosus* and *curtipes* group (Zoe 4, 28) I append some notes on species kindly sent me by Mr. Brandegee.

Astragalus near to *oocarpus* San Thomas, Lower California, April 26, '93. Same as the following except more robust and tall; peduncles not longer than leaves, stout; stem coarsely sulcate; leaves six inches long; petiole none; leaflets about twenty pairs, an inch long; pods more acute; flowers white, four lines long, narrow, calyx the same; keel abruptly rounded, straight, nearly equaling the oblanceolate, scarcely ascending wings; banner erect, small, barely a line longer than the keel

and one-half a line longer than the wings; stipules green, rather stiff, reflexed, triangular, acute, two lines long.

Astragalus near to *Parishii*. Vallederos Creek, Lower Cal., May 4, 1893. Stems ascending, many from a perennial root, a foot high, nearly smooth; peduncles four to six inches long, longer than the leaves; flowers small, three lines long, yellowish, spicate at the tip of the peduncle, reflexed; calyx campanulate, tube a line long, teeth triangular, one-half a line long; pods an inch long and half as wide, broadly elliptical, sessile, spicate, horizontal, one-celled, chartaceous, much inflated, barely acute, dorsal suture much more convex than the ventral, ventral suture somewhat inflexed, sutures thin; seeds rather large, on short stalks, confined to the middle of the pod as in most of this group, several; stipules triangular, not reflexed, two lines long; pedicels less than a line long, about equaling the ovate bracts; petiole an inch or less long; leaflets oblong, about eleven pairs, obtuse at apex and acute at base. The pods are finely reticulated, glabrous or minutely pubescent when young.

Astragalus between *oocarpus* and *Parishii*. San Pedro Martir, Lower California, May 6, 1893. About the same as *A. Parishii*, but stipules almost hyaline and seldom reflexed; peduncles twice as long as the leaves, with yellow flowers above the middle; pod one and one-half inches long; keel arched, wings very much so. It is quite probable that one polymorphous species will cover most of this group.

Astragalus Hookerianus Gray. This neat little group represented by two supposed species can be described so far as known in two words, i. e., pods balloon-shaped. Mr. Brandegee's specimens from Susanville, Cal., June 30, 1892. Stems a foot high, decumbent at base only; very minutely pubescent; leaflets elliptical to linear one-third to an inch long, acutish, about seven pairs; leaves two to four inches long and proper petiole less than an inch long; peduncles four to six inches long; flowers racemose near the end of the slender peduncle, in fruit distant; pods two inches long, half as wide, papery, finely reticulated, more or less spotted, rounded at apex and tapering into a stipe, ascending or nearly erect, much inflated, sutures very small and not at all

intruded; seeds large, fully a line long and nearly round, on a stalk a line long, few, confined to the middle of the pod; calyx one and one-half lines long, campanulate, scarcely oblique at narrowed base; subulate teeth one-half shorter. The cross section of the pod is probably round.

Specimens collected by Mr. Lemmon in Sierra County have long underground stems and short ascending stalks, four inches high, decumbent; pods thicker, one-half as large, more attenuate, with the stipe only equaling the calyx; leaves ovate to elliptical, acute, with prominent midnerve and very hairy. This would seem to connect with *A. Whitneyi.* The pods of both these species are one-celled. The flowers are not found in these specimens, but are said to be white in the former and purple in *A. Whitneyi.*

Astragalus proriferus n. sp. San Pedro Martir, Lower California, May 5, 1893, Brandegee. Allied to *A. Hornii.* Shrubby at base, one to two feet high, stems ascending, whole plant hoary with very short woolly pubescence which is denser above; the flowers only are glabrous, not the calyx; leaves four inches long, with a petiole an inch or less long; leaflets about ten pairs, oblong-lanceolate and obtuse but apiculate, to obovate and obtuse and not apiculate, three to ten lines long and one to three wide, acute at base; stipules triangular, herbaceous, acute, two to three lines long, upper ones little reduced; peduncles stout, one-half as thick as stem, six inches long, erect, many flowered from below the middle, racemose in fruit and spicate in flower; flowers dark purple, but keel lighter, fading to ochroleucous; calyx broadly campanulate, tube a line long, oblique, cleft deeper above; pedicels almost obsolete shorter than the obscure ovate bract, teeth as long as the tube, subulate, erect; keel three lines long, bent abruptly to a right angle or more at tip, acute, arched a trifle; wings lanceolate and apparently notched at tip; banner rather large, nearly round, ascending 80° abruptly from a point beyond the calyx teeth, a line longer than wings and keel, emarginate; pods obliquely ovate to oval, six lines long, three to four wide, chartaceous, inflated, one-celled, neither suture in the least inflexed, dorsal suture not evident, ventral suture much thickened in the middle where only, it is

seed-bearing, sessile, rounded at base, early splitting the calyx, cross section apparently broadly obovate, tip with a very pronounced flat and sharp, triangular beak, two lines long; dorsal suture very convex, ventral slightly so; seed stalk one-half a line long. Flowers and pods horizontal or nearly so. The spike of flowers reminds one of those of *Oxytropis deflexa*.

Astragalus inversus, n. sp. Allied to *A. stenophyllus* and *collinus*. Susanville, California, July 1, 1892, Brandegee. Glabrous throughout. Stems flexuose two feet long, straggling upward, small, apparently simple, faintly angled, floriferous above the middle, nodes two to three inches apart; stipules, lower ones, rather small and united at base, the rest green and tapering to a long point and reflexed, four lines long, distinct; peduncles ten inches long, as stout as the stems, at least twice as long as the almost filiform petiole and leaflets; leaflets an inch long, distant, about three pairs, all jointed to the petiole; flowers loosely racemose on the upper half of the peduncle, six to ten, distant in fruit, ochroleucous; keel very gently arched at tip and blunt, narrow, rather long-clawed, six lines long, nearly equaling the narrow obtuse wings and small banner, the latter ascending only; calyx teeth very short-triangular, one-quarter the length of the campanulate tube which is one and one-half lines long and narrowed at base, not oblique, apparently equally toothed, dark and finely pubescent; pedicels a line or less long; bracts minute, ovate; flowers ascending, in fruit reflexed but not pendulous; pod long acuminate at each end, compressed, one and one-half inches long, two lines wide, linear, cross section elliptical or narrower, one-celled, sutures not prominent nor at all impressed, dorsal suture concave and ventral convex and so the pod seeming wrong side up; stipe not jointed, nearly an inch long about half as long as the pod; seeds nearly round, many. The pod is purple and streaked with white, cartilaginous.

Astragalus collinus Dougl. var. *Californicus* Gray. To this I refer with some hesitation a plant collected at Ager, Siskiyou County, California, July, 1887, by Brandegee. Glabrous, cartilaginous, reticulated pods two inches long, two lines wide, and stipe three-quarters of an inch long, cross section oval, seeds a line

long and oval; leaflets ovate to oblanceolate, six lines long; leaves three inches long and calyx softly pubescent and whole plant otherwise glabrous; peduncles six inches or more long, erect and as stout as the stems; calyx campanulate with tube two lines long, the short triangular teeth one-third as long as tube; flowers not seen; pedicels stout, a line long; bracts very small; many stemmed from a woody root, one and one-half feet high, but base of stem bent, branched below. This at first sight seems to be very distinct from *A. collinus* but I cannot refer it elsewhere.

Potentilla (*Ivesia*) *Kingii*, var. *incerta*, n. var. Densely white silky throughout; leaflets obovate or ovate, densely imbricated; leaves three inches long, more slender than the type. Otherwise as in the type. Alkaline soil in the middle of Steptoe Valley E. Nevada, 5700 feet altitude, July 13, 1891. I am not able to compare this with *Potentilla eremica*, Coville which from the description would seem to be the same, but this is manifestly only a variety of the type as it shades into it.

Cymopterus purpurascens (Gray) *C. montanus* var. *purpurascens* Gray Bot. Ives. I cannot think that this plant which is so common from one end of Utah to the other and covers so wide a range is a form of the Rocky Mountain species which so far is not known west of the mountains of Colorado.

Cypmoterus Fendleri Gray. This species belongs to my section *Coloptera* and to it should be referred *C. Parryi* (C. & R.), *C. decipiens* Jones. I was misled by Watson's unwarranted reference of one of my specimens to *C. Fendleri* or I should have recognized the true place of *C. Parryi* in the synonymy.

Frasera speciosa Douglas var. *scabra* n. var. Closely resembling the type except that the root leaves are six to eight inches long, one and one-half inch or less wide; whole plant ashy scabrous even to the petals; the leaves are very nervose (seven of the nerves being very prominent), thick; petals oblong, three-quarters inch long, very obtuse and rounded; glands as in the type but very coarse, three to four lines long, attached below the middle and running nearly to the base, oblanceolate, acute at base, coarsely fringed; scales at base of petals coarse; anthers

reflexed, two lines long; stigmas enlarged and club shaped. This seems to be a good species but in view of the great variability in this genus I refer it here. It is about the height of the type, but the leaves are half as large and the flowers twice to three times as large. Collected at Pine on the edge of the Mogollon Mesa northern Arizona, June 2, 1890. Characters common to the type species and this are the long pedicels, narrow and very acute calyx lobes, equaling the corolla; greenish-speckled petals, glands and scales; verticillate leaves; stamens nearly as long as the petals; glands attached below the middle. Gray says in the Synoptical Flora that the glands are attached above the middle, but it is not true.

Notes taken by me this year at Alta, Utah, August 17, 1893, on the type species are as follows: Petals oval, five lines long, three and one-half wide, a little cucullate by the folding of the tip of the petals which are very acute, petals concave; two glands on each petal three lines long and one-half a line wide, they run within two and one-half lines of the tip of the petal and one-half a line of the base, rounded at each end and protected by lacerate hair-like scales a line long; base of petals with stiff scales two lines long; anthers inverted, extrorse, sagittate; stigma spoon shaped, bent, single; stamens just surpassing the stigma, spreading after anthesis.

Emmenanthe foliosa n. sp. A close congener to *E. pusilla* and with the same habit, frequenting alkaline soil. Deep Creek, Utah, June 6, 1891, altitude 5000 feet. Minutely and rather densely pubescent and somewhat glandular; blade of leaves one-half inch long and one-third the slender petioles, irregularly laciniate dentate, lanceolate to oblong, obtuse apex rounded; leaves not fleshy, rosulate mostly; annual, much branched from the base, one to three inches high; flowers single in the forks and in loose racemes which equal the leaves and are floriferous from base of peduncle, three to five flowered; pedicels not longer than the calyx, slender; calyx a line long in flower and two lines in fruit, lobes linear and very little enlarged at apex; corolla barely lobed, yellow and almost equaling the calyx, and overtopping the oval or oval-oblong, rounded and obtuse capsule which has a very short style and is eight-seeded; seeds large,

deeply corrugated at right angles to the length and rather irregularly, no reticulations across the corrugations, or scarcely visible, seeds dark brown.

Compared with *E. pusilla* the flowers are a little larger, yellow, as long as capsule; seeds four times as large and corrugated and scarcely reticulated, while the other has seeds spirally corrugated, black, with pits almost exactly those of a honeycomb and seeds contracted at each end, the seeds of this species are narrower and less pointed; the pubescence is also different.

Phacelia pinetorum n. sp. Habit and general appearance of *P. micrantha*, as slender but less leafy, nearly erect, but rather widely branched, three to eight inches high, first pair of leaves ovate, long-petioled, entire, small, lower leaves simply pinnate with oblong lobes which are not widened at apex, lower petioles not margined or scarcely so and as long as the blade, uppermost leaves oblong-linear, six to twelve lines long, entire or tridentate at apex, sessile, scarcely enlarged at base; pedicels one to four times the calyx, occasionally minutely glandular, always hirsute-hispid as well as the calyx; the leaves are sparsely hirsute pubescent and not glandular; calyx lobes lanceolate or ovate, narrower at apex or acutish, equaling or twice as long as the short campanulate, white or blue corolla; appendages about one-third the distance from the base of filaments to base of lobes and in pairs; capsule globular; seeds few oblong or ovate to oval, very deeply favose, not transversely corrugated nor tuberculate; calyx enlarging.

Under pines in the Deep Creek Mountains at 8000 feet altitude, growing in situations similar to *Polemonium micranthum*. June 12, 1891.

Gilia pentstemonoides n. sp. Cæspitose from a much branched perennial root; leaves linear-oblanceolate, acute, two inches long, densely fascicled at the summit of the root branches gradually contracted into a slender petiole, entire, rather thick, glabrous; paniculate stems four inches high, but proper stem an inch long, with short racemes arising from the axils of the scarcely smaller stem-leaves which are three to five in number; upper

stem glandular-hairy; calyx tube equaling its subulate lobes, a line long, on a slender pedicel as long; corolla blue, salverform, tube three lines long, lobes ovate or oval, one and one-half lines long; stamens and style long exserted; capsule oval, two-thirds the length of the calyx. Collected at Cimarron, Colorado, on rocks, September, 1890.

Pentstemon confusus n. sp. Uniformly referred by Gray and Watson to *P. acuminatus*. About a foot high, glabrous, and inclined to be glaucous; flowers open, inclined to be horizontal; pedicels one to four lines long; calyx lobes very broad, acute, with hyaline margins; corolla three-quarters of an inch long, narrow and with large lobes, narrowest in the middle, gradually enlarged above, bilabiate, veiny, red, lobes in dried specimens blue with a purple sheen; uppermost leaves not auricled, somewhat clasping, seldom ovate; small sterile filament usually glabrous; otherwise as in *P. acuminatus*. This is the same as my No. 1819 in my Utah sets of 1880. This has always been confounded with *P. acuminatus* by Watson and Gray, and is probably the plant of the Great Basin referred to *P. acuminatus*, while the other is confined to the plains of Colorado and northward and may swing westward at the north into Montana. Also collected by me at Detroit, western Utah, May 26, 1891. It frequents dry sandy slopes in the foothills.

Pentstemon Moffatii, Eastwood. This is what I take to be the same plant as described by Miss Eastwood in Zoe and to which I have given a name in my still unpublished manuscript. Mr. Robinson refers it to *P. albidus* with which I do not agree. As I understand that plant it is confined to the region of the plains. I find that these plants are (in my specimens) pruinose pubescent throughout and with glandular hairy inflorescence; the root leaves are oblanceolate to ovate and with a cuneate base; petiole not longer than the leaves; lower stem leaves linear-oblong to oblanceolate, with or without a clasping base; the upper leaves are broadly ovate and with an acute or acuminate apex; flowers on very short pedicels, three-quarter inch long, purple, gradually ampliate, proper tube short; sepals large, ovate to lanceolate, acute; capsule ovate and acute, longer than the

sepals. The insertion of the two pairs of stamens unequally is, so far as my field studies go now, a generic and not a specific character of which I will write more at another time. Collected by me at Thompson's Springs, Utah, on the slopes of the clay hills on May 7, 1891.

Pentstemon deustus, var. *pedicellatus*, n. var. pedicels two to four lines long, rarely six lines long in the lower flowers; upper peduncles obsolete; all the filaments antheriferous; flowers dirty white and veined with purple; six to eighteen inches high, almost glabrous except the pubescent corolla. Among junipers and pinons at about 8000 feet altitude on gravelly slopes of mountains. July 3, 1891, at Muncy, Nevada, and also at Cherry Creek on the fourteenth of July. Local and rather common in such places.

Eriogonum rubiflorum n. sp. Near *E. reniforme* but leaves oval to orbicular, almost glabrous above, densely floccose tomentose beneath, not cordate, on petioles of equal or double length, blade six lines long; loosely pilose at the nodes, branched above, six inches high; pedicels and involucres glandular-hairy; pedicels four to six lines long, usually erect or spreading, but lower ones often reflexed (in rare cases all the pedicels are reflexed); involucres fully a line long, rather deeply lobed and lobes deep blood-red, hyaline-margined; flowers a line long, red with very deep red midvein which stops short of the rounded, emarginate tip; lobes oblong, glabrous. The prettiest of the *Ganysma* group. May 28, 1891, Dugway, Utah, on the open level places at 5000 feet altitude. It is also very common in eastern Nevada in similar situations.

Eriogonum bicolor n. sp. Matted cæspitose forming mats one to two feet in diameter from a very thick woody stem whose bark exfoliates like *Artemisia tridentata*, one to three inches high; whole plant tomentose to the glabrous perianth; leaves linear, revolute, six to eight lines long; peduncles scapose, an inch long, bearing a single rather large involucre or occasionally three; bracts minute, green; involucre two lines high, turbinate, not angled, eight-toothed and teeth short and hyaline; pedicel two lines long, erect; flowers five to ten, a line long, base hemi-

spherical and not prolonged, red; lobes orbicular and generally emarginate, white, equal or nearly so. A casual observer would take this to be a form of *E. microthecum*, but it really belongs to the *Pseudo-umbellata*. May 7, 1891, Thompson's Springs, Utah, on adobe plains.

Eriogonum villiflorum var. *candidum* n. var. This is by far the more common form; densely white tomentose throughout even to the flowers, not at all villous; heads very densely short peduncled. July 21, 1891, at Furber, eastern Nevada, at 6000 feet altitude, also at Glencoe, Dugway, etc., western Utah.

ADDITIONS TO THE FLORA OF COLORADO—FUNGI.

BY T. D. A. COCKERELL.

The following fungi are not all new to the flora of the State, but doubtless most of them, at least, have not been recorded. The literature available to me is not sufficient to indicate precisely what has been placed on record—and had I the means, I have not the time to search the numerous publications which may contain references to Colorado fungi.

The names within square brackets after the species are those of the botanists to whose kindness I have been indebted for the identification of the specimens.

1. *Æcidium ranunculacearum*, D. C. [D. C. Fairchild]—on *Anemone cylindrica*, West Cliff.

2. *Melampsora lini*, P. [D. C. Fairchild]—on *Linum perenne* (the form I think called *lewisii*) West Cliff.

3. *Æcidium compositarum*, Mart var., *helianthi*, Burrill. [D. C. Fairchild]—on *Helianthus nuttallii*, West Cliff.

4. *Æcidium ræstelioides*, E. & E. [D. C. Fairchild]—on *Sidalcea malvæflora*, West Cliff.

5. *Æcidium compositarum*, Mart. [D. C. Fairchild]—on *Aster lævis* f. *simplex*, Cusack Ranch, Custer County.

6. *Uromyces euphorbiæ*, C. & P. [Fairchild]—on *Euphorbia maculata*, West Cliff.

7. *Uromyces aconiti-lycotoni*, (D. C.) Wint. [Fairchild]—On *Aconitum Columbianum*, Cusack Ranch, Wet Mountain Valley.

8. *Puccinia atropuncta*, Pk. & C. [Fairchild]—On *Veratrum Californicum*, Cusack Ranch, Wet Mountain Valley. Other specimens on the same plant from the same locality were named *P. Veratri*, Niessl. [Galloway].

9. *Erysiphe communis* (Wallr.) Fr. [Anderson]—On *Thermopsis montana*, Cusack Ranch, Wet Mountain Valley.

10. *Æcidium thalictri*, Grev. [Anderson]—On *Thalictrum* (*Fendleri?*) Smith's Park, Custer County.*

11. *Puccinia fusca* Wint. [Galloway]—On *Anemone patens* var. *Nuttalliana*, Cusack Ranch, Wet Mountain Valley.

12. *Æcidium astragali*, Thum. [Galloway]—On *Astragalus* (perhaps *alpinus*), near Brush Creek, Custer County, prox. 9000 feet. Also identified by Mr. J. B. Ellis.

13. *Æcidium berberidis*, Pers. [Galloway] — On *Berberis Fendleri*, near Durango, collected by Miss A. Eastwood.

14. *Æcidium compositarum* var. *ambrosiæ*, Burl. [Galloway] —On *Artemisia franserioides*, Smith's Park, Custer County.

15. *Æcidium senecionis*, Desm. [Fairchild] — On *Senecio*, Silverton, collected by Miss A. Eastwood.

16. *Uromyces junci* (Desm.) Tul. [Ellis]—On *Juncus*, West Cliff.

17. *Ustilago longissima*, Tul. [Ellis]—West Cliff, May 24.

18. *Puccinia graminis*, Pers. [Galloway] — Near Texas Creek, Wet Mountain Valley, on grass.

19. *Cronartium asclepiadeum* var. *thesii*, Berk. [Ellis]—On *Comandra pallida*, along Short Creek, Wet Mountain Valley.

20. *Tuberculina persicina*, Ditl. [Ellis]—On *Æcidium* on *Berberis Fendleri*, near Durango, collected by Miss Eastwood.

21. *Puccinia violæ* (Schum.) D. C. [Galloway]—On *Viola*, Elk Mountains, above timberline, collected by Miss Eastwood.

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* I find, however, that an *Æcidium* from the same species of plant and the same locality was identified for me by Mr. Galloway as *Æ. sommerfeltii* Johanson.

22. *Puccinia aberrans*, Pk. [Ellis]—On *Erysimum asperum* var. *arkansanum*, along Willow Creek, Wet Mountain Valley.

23. *Oidium monilioides*, Lk. [Ellis]—On grass, near Short Creek, Wet Mountain Valley.

24. *Uromyces scutellatus* (Schrank) [Ellis]—On *Euphorbia montana*, near Short Creek, Wet Mountain Valley.

25. *Æcidium monoicum*, Peck. [Farlow]—On *Arabis*, near Short Creek, Wet Mountain Valley.

26. *Melampsora epilobii* (Pers.) Fckl. [Ellis]—teleutospores; Wet Mountain Valley.

27. *Uredo ribicola*, C. & E. [Ellis]—By Short Creek, Wet Mountain Valley.

28. *Phragmidium subcorticium* (Schrank) Wint. [Ellis]—On rose, along Short Creek, Wet Mountain Valley.

29. *Puccinia caricis* (Schum.) Reb. [Ellis]—Along Short Creek Wet Mountain Valley.

30. *Puccinia suaveolens*, Pers. [Ellis]—On *Cnicus*, near Ula, Custer County.

31. *Puccinia variabilis*, Grev. [Ellis]—On *Taraxacum officinale*, Hardscrabble District, and along Swift Creek, Custer County.

32. *Poria tenella*, B. & Cke. [Ellis]—Wet Mountain Valley.

33. *Trichoderma viride*, Pers. [Ellis]—Wet Mountain Valley.

34. *Hemiarcyria clavata*, Pers. [Ellis]—Along Short Creek, Wet Mountain Valley.

35. *Entypa subtecta*, Fr. [Ellis]—on *Populus tremuloides* Wet Mountain Valley.

36. *Odontia fimbriata*, Pers. [Ellis]—near Short Creek, Wet Mountain Valley.

37. *Næmaspora populina*, Pers. [Ellis]—on bark of Cottonwood, Cottonwood Springs, Pueblo County.

38. *Hypoxylon rubiginosum* (Pers.) Fr.—near Short Creek, Wet Mountain Valley. Identified by Mr. Ellis.

39. *Valsa nivea*, Fr. [Ellis]—on *Populus tremuloides*, Wet Mountain Valley.

40. *Hypomyces aurantius* (Pers.) [Ellis]—on *Populus tremuloides*, Wet Mountain Valley.

41. *Hypocrea richardsoni*, Berk & Mont. [Ellis]—on *Populus tremuloides*, Swift Creek, Custer County, and Los Pinos Creek basin, Saguache County.

42. *Lentinus sulcatus*, Berk. [Ellis]—Near West Cliff.

43. *Polyporus biformis*, Ketz. [Farlow]—By Swift Creek, Custer County.

44. *Polyporus arcticus*, Fr. [Ellis]—Near Swift Creek, Custer County.

45. *Polyporus arcularius*, Fr. [Ellis]—Pueblo County.

46. *Polyporus cæsius*, Fr. [Ellis]—Wet Mountain Valley.

47. *Polyporus adustus*, Fr. [Ellis]—Wet Mountain Valley.

48. *Polyporus hirsutus*, Fr. [Ellis]—Near Short Creek, Wet Mountain Valley, alt. 8400 ft.

49. *Elaphomyces variegatus*, Vitt [Ellis]—Near Texas Creek, Wet Mountain Valley.

50. *Tulostoma mammosum*, Fr. [Ellis]—Near Brush Creek, Wet Mountain Valley.

51. *Mycenastrum corium*, Desv. [Ellis]—Wet Mountain Valley.

52. *Lycoperdon lilacinum*, Berk. & Mont. [Ellis]—Near Swift Creek, Custer County.

53. *Bovista circumscissa*, Berk. & Curt. [Farlow]—Near Swift Creek, Custer County, very common.

54. *Morchella esculenta*, Pers. [Ellis]—By Swift Creek, Custer County.

55. *Coprinus ephemerus*, Bull. [Ellis]—Near Short Creek, Custer County.

56. *Lenzites sepiaria*, Fr. [Ellis]—Wet Mountain Valley.

57. *Agaricus campestris*, L.—Custer, Montrose, Mesa, and Gunnison Counties.

BOTANICAL NOTES.

South of Monterey, along the coast there is a place that is known as Slate's Hot Springs. Mr. Slate's house is the only one, and his neighbors are remote. Behind the house a gulch extends up into the hills and along the mountain stream the redwoods, madroñas, laurels, and chestnut oaks make a deep shade. It was in an open spot in this ravine that a strange strawberry was found differing noticeably from the common *Fragaria Californica*. The petals were yellow, sepals large, peduncles erect and the brilliant red fruit had a sweet, insipid taste. Quite a patch was seen in a limited area.

Mrs. Slate explained the introduction of the stranger which proved to be *Fragaria Indica*. She had bought it from a florist and planted it in a hanging basket out of doors. The birds were attracted to the berries, and so the seeds had been distributed to two distinct localities where it seems to flourish. It may become common along the coast, and this record of its introduction will be of value in settling its origin. All well-authenticated instances of the agency of birds in distributing plants ought to be noted.

Aquatic plants are more alike the world over than any other class, and it is explained when it is remembered that water birds travel far and carry seeds in their stomachs, in their plumage, and in the soil that collects on their feet.

The common German Ivy, *Senecio scandens*, is another escape from Mrs. Slate's flower garden. It grows along the ocean cliffs where the hot sulphur springs are situated. It has become vigorously naturalized also in San Francisco along the Presidio marshes and in other places.

Ceanothus impressus Trel. was collected by L. Jared southwest of Guadalupe, towards Point Sal, Santa Barbara County, about fifteen years ago, and has recently been re-collected near the same place by Mrs. Ida M. Blochman.

Prunus fasciculata Gray is reported by Mr. Jared from the sand hills between Moro and Pecho Beach. It is reported also by Mrs. Blochman.

Leptosyne gigantea Kell. was sent to Harvard about fifteen years ago by Mr. Jared. It was its first discovery on the main-

land. Mr. Jared found it growing abundantly near the old wharf at Point Sal.

Calamintha mimuloides Benth. is reported, in the Botany of California, from the Carmel River, Monterey County. It has recently been discovered by Dr. H. E. Hasse at Acton, Cottonwood Cañon, San Bernardino Range, Los Angeles County.

A. E.

E. L. GREENE *VERSUS* ASA GRAY.

Edward L. Greene, Professor of botany at the State University of California, makes, in the August number of the Torrey Club Bulletin, an entirely uncalled-for attack upon the greatest systematic botanist America has produced, and as that journal has a rather restricted circulation on the Pacific Coast, the paper is here reproduced that botanists of the West may have an opportunity of judging what manner of defense Professor Greene is able to make against criticism and what weapons he is capable of using. Few will believe that this article would ever have appeared if Gray were living.

NEW HONORS TO OLD WEEDS.

BY EDW. L. GREENE.

The modern history of Californian botany was taken up by men who had never seen the field of their researches, and who had no conception of the number of foreign plants that had become naturalized in this part from Europe a hundred years ago. Many of these had not made their appearance in New England, and were unfamiliar to New England botanists. Several such plants, well-known to botanists in general for several centuries, obtained new names at the hands of writers of the East, as if they had been quite new to science. Dr. Britton, in the last issue of this journal, has been able to identify as old, one of my own supposed new plants; and I may here be allowed to indicate that botanists of note have added to synonymy in this manner, before me. Asa Gray, in his day, gave new names to not less than five extremely common and familiar weeds of the Old World, the specimens of which had come to him from this unsuspected habitat of California.

When, nearly twenty years ago, the present writer sent him *Convolvulus arvensis* from California, his letter in answer shows that he had considered this to be an exclusively Californian species, the *C. Californicus*, of Choisy; and when, a few weeks later, the real *C. Californicus* was transmitted, he named this *C. Soldanella*, an Old World species. But errors of this kind, of

which he and other so-called "authorities" on West American botany have made scores and hundreds, do not come directly under my heading, being errors that did not go into print. The Old World *Convolvulus* to which Dr. Gray gave a new name, as a new species, and in the wrong genus at that, is a grain field weed, as common in California as in Europe—*C. pentapetaloides*, Linn., which he named *Breweria minima* (Proc. Am. Acad. xvii. 228). This error he some years afterwards discovered and corrected. But there is one seeming more inexcusable which has not yet been corrected, though it was detected by me while Dr. Gray was still living; for I was loath to call his attention to a mistake, the discovery of which by another would naturally be somewhat humiliating. I refer to a new name that he gave to a plant of such ancient and world-wide repute as Pennyroyal, the *Mentha Pulegium* of Linnæus. In this error Dr. Kellogg, it must be admitted, led the way; for when the plant appeared to him he named it as a new *Hedeoma*, *H. purpurea* (Proc. Calif. Acad. v. 52). In working up the Labiatæ for the State Survey volumes, after having examined this plant minutely, Dr. Gray simply transferred it to the Californian genus *Micromeria*, where, as he remarks, it is "anomalous;" and so it stands to-day in the Synoptical Flora, as *Micromeria purpurea*, Gray. It is abundant not only on that island in the San Joaquin River, whence Dr. Kellogg and Dr. Gray had it, but also in several parts of Middle California rather remote from that station; and not more than one species of mint, *M. piperita*, has been more familiarly known in all countries during many centuries.

A dozen years ago I found by the wayside, in Berkeley, a Cichoriacea new to me, and of which no account was given in the State Survey volumes, or in any other American book; but, suspecting it of alien derivation, I soon found it to be *Crepis virens*, Linn., one of the most cosmopolitan members of its genus. But Dr. Gray twice mistook this plant for a new species, assigning it two new names, one in each of two distinct genera. It is his *Malacothrix crepoides* (Pac. R. Rep. xii. 49), and *Crepis Cooperi* (Proc. Am. Acad. ix. 214); and it was a friendly fortune which permitted him to make this correction of a humiliating two-fold error with his own pen. Even *Malva parviflora* was by this author new-named *M. obtusa* when first it went to him from California.

I am said to have given the new name *Paronychia pusilla* to an obscure weed of Southern Europe, of which the real name is *Herniaria cinerea*. It is the only instance in which I have honored an old weed with a new name; and as I have worked upon the Californian flora now nearly as many years as Asa Gray did, my record in this respect seems not likely to prove worse than his, to say the least.

The opening paragraph of Mr. Greene's statement implies what he knows to be untrue. The identification of *Paronychia pusilla* was made in the "Botanical Writings of Edward L. Greene," published in Zoe for April. In the preparation of that

article Dr. N. L. Britton was applied to for some examples of Mr. Greene's Caryophyllaceæ, but very shortly after the letter was dispatched a fragment of *Paronychia pusilla* reached the writer from another source, and it was identifiable at a glance. Some time afterwards, and when the correction was already printed, Dr. Britton replied to my letter by saying that the plant in question was the old *Herniaria cinerea* of Linnæus, and that he had made a note to that effect for publication. The remarks of Mr. Greene on *Convolvulus arvensis* and *Californica*, for which, according to his own account, he has rifled the private letters of Dr. Gray, show a not entirely unexpected moral laxity, and a recklessness of consequences quite out of keeping with his character and which can only be accounted for by his forgetfulness of the old proverb concerning the danger of stone-throwing by one whose house is so roofed and walled and even floored by glass.

The remarks made by Mr. Greene about his discovery during the lifetime of the latter, of Dr. Gray's "inexcusable" error in transferring Dr. Kellogg's *Hedeoma purpurea* to Micromeria and his own magnanimity in shielding him from the "humiliating" knowledge give a pleasant surprise to those who were cognizant of the truly ecclesiastical hatred which he felt for Gray in the last three years of his life. This kind of statement should, however, be made with much caution and a due regard to the danger of the existence of proof that the "discovery" was made at a much later date. Besides, though it is extremely painful to be obliged to demolish another of Mr. Greene's "facts," *Micromeria purpurea* is not **Mentha Pulegium* as he affirms. If he has a specimen of the latter—it is not at all so common in California as he would have us believe—one of his students will be able to tell him that *Mentha Pulegium* has the throat of the calyx closed by a villous ring and belongs to a different section from *Mentha Canadensis*. Dr. Kellogg in the original description of *Hedeoma ? purpurea*† says "throat naked. * * * This

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*This plant has been identified in a paper on the "Flora of Bouldin Island," Zoe, iv, 211-218. Reprint issued August 22, 1893. Dr. B. L. Robinson of the Gray Herbarium concurring after comparison of abundant material from the type locality, sent to him in 1892.

†Proc. Cal. Acad. v. 52.

plant, it may be said, cannot belong to *Hedeoma* for the throat of the calyx is not bearded. * * * In the new genus *Poliomintha* Gray, the calyx still has the villous ring—this, none." Dr. Gray says "naked in the throat."* Possibly Mr. Greene in spite of the unnecessary sneer about Dr. Kellogg leading the way, will admit that the latter's testimony as to easily observable matters of fact coming under his eyes, is trustworthy. Dr. Gray's statement is, of course, of no sort of consequence in the estimation of Mr. Greene, neither is that of the writer who examined the type two years ago in the Gray Herbarium at Harvard.

Mr. Greene says, "A dozen years ago I found by the wayside in Berkeley a Cichoriacea new to me, and of which no account was given in the State Survey volumes or in any other American book," while as a matter of fact *Crepis Cooperi* is given with its synonym in Bot. Calif. i, 436, published in 1876, and the full descriptions therein indicated are both in older American books. The only knowledge Mr. Greene has of these matters is evidently Dr. Gray's own statement in the Synoptical Flora, for in his usual second-hand fashion he copies the incorrect reference given there to the Pacific Railroad Reports.

The concluding short paragraph of Mr. Greene's article contains three distinct misstatements: (1.) *Herniaria cinerea* is not an "obscure weed," but quite the contrary. (2.) It is not the only instance in which Mr. Greene has "honored"! an old weed with a new name. He conveniently forgets *Ranunculus Biolettii*, *Alsinella ciliata*, various species of "Tissa," *Lythrum adsurgens*, *Lythrum Sanfordi* and *Biolettia riparia* though the last, to be sure, only immigrated from Texas. (3.) Mr. Greene may have "worked upon the Californian Flora nearly as many years as Asa Gray did," but if so he furnishes the world with its first example of a sucking botanist. Gray's active work on our Western botany began with The Flora of North America, 1838, and ceased only with his death in 1888. Mr. Greene was born in 1843, and made his first Californian collection at Yreka in 1876, where he was the minister of a small Episcopal congregation. His incumbency lasted for but a few months, and he soon after

*Bot. Calif. i, 595; Syn Fl. ii part i, 359.

left the State for some years. As a systematic botanist Mr. Greene began to write in the year 1880, and his first contribution to the literature of Californian botany was made in 1881.

Mr. Greene is most evidently of opinion that any comparison between his work and that of Dr. Gray must be immensely to the disadvantage of the latter, but there are a few things it might be well for him to remember. One of these is, that Dr. Gray's work on Western botany is essentially that of a pioneer, that he worked always under pressure, and that the great preliminary work accomplished by him has enabled a swarm of others without half his mental grasp to labor acceptably in more restricted fields, and sometimes, as in the case of Mr. Greene, to wound the kind hand which led their first weak footsteps in the determination of plants.

Dr. Gray made many errors, as must be the fate of any botanist so situated, but he never hesitated to admit and correct them, in which characteristic he differs strikingly from Mr. Greene, and he was thoroughly incapable of "covering the nakedness of his own incapacity with the mantle of another's culpability" a process in which it is to be hoped Mr. Greene will have few imitators. K. B.

BOTANICAL MEETINGS AT THE ANNUAL ASSEMBLY OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

SECTION G.—A. A. A. S.

The following papers were read either in full or by title:

Photography as an Instrument for recording the microscopic Characters of Micro-organisms in artificial Cultures, by G. F. Atkinson.

Symbiosis in the Roots of Ophioglossaceæ, by G. F. Atkinson.

Observations on a Rust affecting the Leaves of the Jersey or Scrub Pine, by B. T. Galloway.

Prophylla of Gramineæ, by W. J. Beal.

A new injection Needle for the Study of the Lower Plants, by J. Christian Bay.

On the Food of Green Plants, by Charles R. Barnes.

Results of some recent Work on Rust of Wheat, by B. T. Galloway.

Comparative Study of the Structure and Function of the Sporangia of Ferns in the Dispersion of Spores, by G. F. Atkinson.

The Solandi Printing applied to Botanical Work, by Byron D. Halsted.

Present Aspects of the Nomenclature Question, by N. L. Britton.

Lichens of the Black Hills, by T. A. Williams.

The Bibliography of American Botanical Literature, by J. Christian Bay.

Notes on the Development of *Marattia Douglasii*, by Douglas H. Campbell.

The fructification of *Juniperus*, by John G. Jack.

The Roots of Orchids, by M. B. Thomas.

Preliminary Notes on some Chromogenic Bacteria of the Ames Flora, by L. H. Pammel.

Further Observations on the Fermentation Tube with special Reference to Anærobiosis, Reduction and Gas Production by Theobald Smith.

Two new and destructive Diseases of Cucurbits, by Erwin F. Smith.

Preliminary Statement concerning Botanical Laboratories and Instruction in American Universities and Colleges, by Conway MacMillan.

On the Quantitative Analysis of the Colors of Flowers and Foliage, by J. H. Pillsbury.

The minute Structure and Development of the Motile Organ in the Leaf of the Red-bud, by S. G. Wright.

The Shrinkage of Leaves in drying, by Byron D. Halsted.

Distribution of the Gramineæ in the United States, by S. M. Tracy.

A Consideration of Species based on the Theory of Evolution, by N. L. Britton.

A Revision of the Genus *Physcomitrium*, by Elizabeth G. Britton.

Deviation in Development due to the use of Unripe Seeds, by J. C. Arthur.

The principal Diseases of *Citrus* Fruits now being studied at Eustis, Fla., by W. T. Swingle.

Cephalurus mycoidea and *Phyllosiphon* sp., two Parasitic Algæ, new to North America, by W. T. Swingle.

An Analysis of the Conditions affecting the Distribution of Plants, by Frederick V. Coville.

A Sclerotium Disease of Plants, by P. H. Rolfs.

Notes on *Ræstelia pyrata*, by L. H. Pammel.

Crossing of Cucurbits, by L. H. Pammel.

A case of poisoning by the Wild Parsnip, *Cicuta maculata*, by L. H. Pammel.

Ulota Americana, Mitten, and *Orthotrichum Americanum*, Beauv., by Elizabeth G. Britton.

BOTANICAL CLUB—A. A. A. S.

The report of the committee on nomenclature, to which had been referred the preparation of a check list, was called for and presented by its Chairman, Mr. N. L. Britton. The manuscript almost ready for the printer was presented, and the following recommendations were adopted:

"*Stability of Specific Names.*—In the transfer of a species to a genus other than the one under which it was first published, the original specific name is to be retained, unless it is identical with the generic name or with a specific name previously used in that genus"—to be amended by striking out all after the word retained.

"That the general sequence of natural orders as taken up in Engler & Prantl's 'Natürliche Pflanzenfamilien' be adopted. [Pteridophyta, Gymnospermæ, Monocotyledonæ, Dicotyledonæ.]"

"That precedence in the same volume be regarded as priority."

The report of the committee appointed last year to consider the advisability of the establishment of an American botanical society was presented by Mr. Barnes. A letter from Mr. L. H. Bailey, Chairman of the Committee, was read as virtually the report of the majority in favor of abandoning the attempt for the present. Eight of the committee thought its organization by the Club impracticable, one favored the organization, but offered no plan of procedure. Mr. Barnes, the remaining member, submitted the following:

"1.—That the Botanical Club approves the formation of an American botanical society whose membership shall be restricted to those who have published worthy work, and are actively engaged in botanical investigation.

"2.—That to this end the Botanical Club proceed to elect ten men, who beyond all question should belong to a society so restricted.

"3.—That these ten be directed to select fifteen additional members, who in their judgment fall well within the limits suggested.

"4.—That the twenty-five persons so chosen be invited to become the charter members of the botanical society, to proceed to organize the same, and to provide for the election of additional members by such methods and on such terms (not incompatible with the intent of recommendation 1) as they see fit."

The names of the first ten selected are not given, but the whole twenty-five are as follows: J. C. Arthur, G. F. Atkinson, L. H. Bailey, C. R. Barnes, C. E. Bessey, E. G. Britton, N. L. Britton, D. H. Campbell, J. M. Coulter, F. V. Coville, Daniel C. Eaton, W. G. Farlow, E. L. Greene, B. D. Halsted, Arthur Hollick, Conway McMillan, B. L. Robinson, C. S. Sargent, F. L. Scribner, J. Donnell Smith, Roland Thaxter, William Trelease, L. M. Underwood, Lester F. Ward, W. P. Wilson. "Two informal meetings of those of the above list in attendance were subsequently held," and a committee was instructed to inform the others of the twenty-five charter members of the action taken, to draw up a constitution, and to report at a meeting to be held beginning on the Monday preceding the next meeting of the American Association.

One would think that there must be a strong motive on the part of some one to form a society in the face of an adverse report of eight out of ten of the committee. That the names do not all represent the best of American botany will probably be conceded. Certainly some of those included set the standard sufficiently low that the young man who has to "win his spurs" before admittance need not grow gray in the effort. It would also be interesting to know which of the botanists honored, consented to the use of their names, and why all of the editors of the Botanical Gazette should be included, while the Torrey Bulletin is cut off with only four.

INTERNATIONAL BOTANICAL CONGRESS AT MADISON.

In July of the present year a call was issued for an International Botanical Congress to be held at Madison, Wisconsin, at the end of the session of the American Association for the Advancement of Science, to be held at that place. The people of the United States are never accused of undue modesty, and in so far as the originators of the movement are concerned, the American botanists have shown themselves no unworthy sons of the nation. Their "International Congress" is likely to go down into history as an ineffectual attempt by a fragment of the American tail to wag the botanical dog.

Early in the year 1892, when the subject was first broached

the editor of the Botanical Gazette made some remarks upon the subject which the character of the Congress renders so extremely pertinent as to make worthy of repetition.

"An International Congress of Botanists is an exceedingly valuable thing, provided it is really what the name implies. If, however, the real botanists, whom we would delight to honor, stay at home, and we have let loose upon us a crowd of quasi-botanists, such a class as is more apt to journey far to congresses than any other, our lines will not have fallen to us in pleasant, places. * * * The percentage of smatterers and cranks is probably as large in other countries as in the United States, and it is well-known that such classes travel further and talk more profusely than any other."*

The Congress duly met and held three meetings. No list of the botanists present being given, we can only infer from the names mentioned that it was in no sense representative even of United States botanists. There seems to have been only one foreigner present, and that one happened to be in the country in charge of a French exhibit at the Chicago Exposition. There was no representative even from Canada or from the Spanish countries south of us. This being the case, the following resolution was adopted without discussion:

"Resolved, that, inasmuch as the attendance of European botanists at this meeting has fallen much below the expectation of the organizing committee, so that the desired international character of the assemblage has not been realized, the name of the meeting be the Madison Botanical Congress."

A committee consisting of Messrs. Bessey, Britton, McMillan, Tracy, and Davis, was appointed to nominate the officers of the meeting, and their nominees were "unanimously confirmed."

Nomenclature of plants was not discussed, it being voted "that inasmuch as the Congress did not possess the international character which had been hoped for, and could not therefore legislate upon questions of nomenclature, it should not further consider the subject."

A committee on the National Herbarium reported, pointing out "the unsafe condition of the present building in which the Herbarium is located, its unusual exposure to loss by fire, and

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* Bot. Gaz. Feb. 1892.

the valuable character of the collections which are contained in it, and urges that steps be taken to provide an adequate and fire-proof building for its reception."

The remainder of the sessions was largely occupied by discussions on the "Nomenclature of Plant Diseases," "On the Terminology of Anatomy and Morphology," "On the Terminology of Physiology," "On the Nomenclature of Horticultural Forms," and "On Bibliography." The Congress wisely refrained from committing itself to any extent upon these questions, possibly it occurred to some of the members that the opinions and practice of European botanists might be factors in the settlement of them.

The Congress which began by electing Professor E. L. Greene for its President, ended appropriately by a vote of thanks to Otto Kuntze. K. B.

GILIA SUPERBA. PHACELIA NUDICAULIS.

Since the publication of Plants of Southeastern Utah, Zoe iv, 2, I have distributed specimens of the new and rare species to the principal herbariums of the country. To Dr. B. L. Robinson of the Gray Herbarium I am not only indebted for the knowledge of some errors in determination, but also for the great privilege of examining some of the types, and so I have the chance to make prompt corrections.

Gilia superba, described as a new species, page 122, and figured in plate xxvii, is *G. subnuda* Torr. Dr. Robinson compared this with the type.

Phacelia nudicaulis n. sp., page 123, is *P. demissa* Gray. This I compared with the type which Dr. Robinson so kindly lent me.

While it is to be deplored that these species are weighted with an additional name, yet the new descriptions with the field notes and plate may serve to ward off another calamity of the same nature. ALICE EASTWOOD.

On a Collection of Mammals from the San Pedro Martir Region of Lower California, with Notes on other Species, particularly of the Genus Sitomys. By J. A. ALLEN. Bull. Am. Mus. Nat. Hist., v, Author's Ed., Aug. 18, 1893, 181-202. This paper is based upon a collection of 250 specimens obtained by Messrs. Thurber and Anthony. The new forms described are *Sitomys americanus thurberi*, *Sitomys martirensis*, *Tamias leucurus peninsulæ* and *Scapanus anthonyi* from the San Pedro region and *Sitomys gilberti* from San Benito County, Cal.

The American Naturalist, Sept. 1893. *Description of Four New Rodents from California.* By SAMUEL N. RHOADS. The four species proposed are *Sitomys major*, *S. herronii*, *Onychomys ramona*, and *Reithrodontomys pallidus*, all from the southern part of the State.

The Prairie Ground Squirrels or Spermophiles of the Mississippi Valley. By VERNON BAILEY. U. S. Dept. Agr., Div. of O. and M., Bull. No. 4, p. 69. Prepared under the direction of Dr. C. Hart Merriam, Chief of Division. An interesting and valuable economic bulletin, with three colored plates and four outline maps of the United States, showing distribution of species by colored areas.

Report of the Ornithologist and Mammalogist for 1892. By C. HART MERRIAM. U. S. Dept. Agr., 181-200, illustrated by fine colored plates of rodents.

The Nidiologist. Published by Henry Reed Taylor, Alameda, Cal. The initial number of a sixteen-paged monthly was issued in September and the October and November numbers have also appeared. The title is not pleasing and brings into use a hybrid word which might have been avoided. The quality of several articles is far above that found in the amateur papers which appear and perish annually; but these articles are by well-known ornithologists who may not continue their support unless a stronger scientific tone is evidenced. Careless proof-reading is found in all three numbers. The half-tone illustrations are certainly interesting and perhaps as good as can be produced with

the quality of paper and press work. Illustrating birds' nests from photographs and accompanying them with descriptive notes is a large field and will take a long time to exhaust the material, but thus far the fund of new information has been but slightly added to.

Planzenfamilien drags itself along in an exasperating, peculiarly German style. Hoffmann in the latest fascicle of Compositæ completes Cynaroideae and Mutisiaceæ and lacks only a few pages of Cichoriaceæ. He makes the number of genera 806. The changes of interest to Western botanists are as follows: Cnicus is restricted to the single species known as *Carbenia benedicta*. Carduus is maintained with the boundaries given by Bentham & Hooker and Cirsium Scop. is adopted for all the species with plumose pappus, known of late under the name of Cnicus. Serinia Raf. is substituted for Apogon Ell. and Sitilias Raf. for Pyrrhopappus DC.; Microseris is maintained in the limits of the Synoptical Flora, Calais, Uropappus, Phæopappus, Ptilophora, Nothocalais, etc., being included as sections or synonyms; Stephanomeria is retained and Ptiloria Raf. resurrected by Mr. Greene is not even mentioned in the synonymy. Rafinesquia Nutt. is kept up and Nemoseris Greene given as a synonym. In Lieferung 90, Taubert keeps up Hosackia.

Silva of North America vol. v.—Hamamelidæ—Sapotaceaæ. By CHARLES SPRAGUE SARGENT, with fifty-four exquisite plates drawn by C. E. FAXON. Too much cannot be said in praise of this magnificent work, the plates of which with detailed dissections are nearly as useful for study as the living plant, and make one sigh for the wasted time spent over old plates in the vain endeavor to find a meaning which the artist failed to give. The only point we can suggest for improvement is that all the dissections in any given genus should be drawn from the same point of view. The plates of special interest to us in the West are *Rhizophora Mangle*, *Conocarpus erecta*, *Laguncularia racemosa*, *Cereus giganteus*, *Cornus Nuttallii*, *Sambucus Canadensis* var. *Mexicana*, *Sambucus glauca*, *Arbutus Menziesii*, *A. Xalapensis and A. Arizonica*, raised to specific rank from a variety of *A. Xalapensis*. *Sambucus callicarpa* Greene is included in the

synonymy of *C. glauca,* but the second species *C. maritima* described from the same clump is not mentioned. Probably it was published too late to find its proper place.

The continual change of names with which we are afflicted at present has led to the printing of the text of *Ardisia Pickeringia* as Icacorea and the plate as Bladhia, and as the synonymy is given in the Index Kewensis there are yet two older names for someone to adopt.

The Development of Azolla filiculoides Lam. By DOUGLAS HOUGHTON CAMPBELL. Extract from Annals of Botany, pp. 155–187, with three excellent double plates.

Index Kewensis an Enumeration of the Genera and Species of Flowering Plants, from the Time of Linnæus to the year 1885 Inclusive, Together with Their Authors' Names, the Works in Which They Were First Published, Their Native Countries, and Their Synonyms. By B. DAYDON JACKSON, *Part I, A.——Den.* 1893.* This monument of Mr. Jackson's untiring industry is absolutely essential to every systematic botanist. The remainder is promised before the end of the next year. The only serious fault is in the matter of dates, which seem to follow no settled rule. The inconvenience is, however, more apparent than real as every botanical writer does or should verify his dates, and it would, by making it so very easy, probably greatly stimulate the practice already far too common of taking up the older names without consideration of the sufficiency of their publication. Undoubtedly errors and omissions will be found in the course of use, but the work bears evidence of great care, the only error in date so far observed by us is in *Aphantochæta* which is given as 1856, and in "addenda and emendata" as 1836. The date on the title page of the part where it occurs is 1857. The good sense and modesty shown in refraining from coining new names, in cases where two valid species bore the same name is in refreshing contrast to the practice of Steudel and a few recent botanists tormented by an itching vanity. The species considered valid are printed in

* The exact date is not given but a copy was mailed in London September 8, and received at the library of the California Academy of Sciences about the end of that month.

Roman, the synonyms in Italic. In this part of the work there are a good many errors, besides those which each botanist will find for himself according to his views, but although it will exactly suit no one, hardly two persons having quite the same opinions, it is on the whole probably quite as satisfactory as would be the work of any other. The lists of species are certain to be eagerly welcomed by certain of the "once a synonym always a synonym" botanists as furnishing opportunity for unlimited changes. K. B.

Transactions of the San Francisco Microscopical Society, Part I. This first part of the publications of the Society is largely historical, the exceptions being interesting articles by Dr. D. W. Montgomery on *Molluscum contagiosum;* Marine Fossil Diatomaceæ from California, and their Zoology, by Dr. A. M. Edwards; and the Santa Monica Diatomaceæ by Henry C. Hyde. A catalogue of its excellent microscopical library is supplied as well as a list of the members, which embraces the names of men who are able to and should do much good work. K. B.

Erythea for September contains an article by Willis L. Jepson on the expedition of La Perouse which visited California in 1786. It is well to refresh occasionally our remembrance of the early navigators, even in cases where their contributions to science were from various causes but slight. Mrs. Ida M. Blochman contributes a paper of interest on "Californian Herb-Lore." Professor Greene furnishes an article on the distribution of some western plants in which he tries to prove that our *Madia sativa* is divisible into three species. His "vernal" and "æstival" periods of flowering will be found quite as unreliable as they are in *Madia elegans.* To save himself further trouble and to satsify the anxiety of the student whom he quotes he might compare *Lepidium Menziesii* Nutt. with *L. bipinnatifidum* Desv. so generally diffused in South America.

The October issue contains a number of West American fungi by Ellis & Everhart, more than half of them in "genera" which are known to be but forms of other genera. Corrections in Nomenclature iii, by Edward L. Greene, on the principle of "once a synonym always a synonym" furnishes new names,

"Forsellesia" and "Bourdonia" for the genera known to us as Glossopetalon and Keerlia, of course with transference of the species as well as genera to the credit of the author. The third instance, more aggravated than even the first two is the transference of Calycanthus L. to Butneria Duhamel, which if adopted would lead to the changing of the large Sterculiaceous genus Buettneria. No species was ever named under Duhamel's Butneria, and Mr. Greene fails to inform us how he succeeded in satisfying himself that it had priority over Beureria Ehret published in the same year, and taken up by Kuntze. *Lotus sulphureus* and *L. tomentosus* are supplied with new names, the author's attention having been called in Zoe for April to their previous use, but *Lotus macranthus* is still unchanged. *Astragalus campestris* Gray is changed to *A. convallarius* Greene because of *A. campestris L.*—now known as *Oxytropis campestris*, and *A. pectinatus* Boiss., a Syrian species is to be called *A. elegantulus* Greene, though the author has not the least idea whether it is a valid species or not. The remainder of the pages are occupied with the doings of American botanists at Madison, which are discussed elsewhere.

The November number under *Novitates Occidentales* describes seven new species of which, waiving for the present the question of their value, *Astragalus demissus* Greene, is a homonym of Boissier's species published in 1849 in Diagn. Pl. ser. i, No. 9, page 50, and *Saxifraga umbellata* Greene bears the same relation to a species of Hooker & Thompson Journal Linnæan Society, ii, (Bot.) 71 (1858). We note for most of the species the usual vagueness of station; Mr. J. G. Lemmon gives some notes on *Pinus insignis* and *P. tuberculata*, which he would have called respectively *P. radiata* Don and *P. attenuata* Lemmon; Mrs. Blochman continues her interesting Herb-Lore notes; and Mr. Greene laments over Baron von Müller's comments on Polanisia which "show that he wholly misapprehends the characters on which Rafinesque's Jacksonia is based, though we have twice announced them very distinctly in Pittonia."

K. B.

Revisio Generum Plantarum Part III. By OTTO KUNTZE. So far as this part is concerned the title is a misnomer. It is

principally occupied by extracts from Kuntze's reviewers and his own comments on the extracts. Only these last are of much interest, most botanists having already read the criticisms in whole or in part. The notes by Kuntze thereon show a great deal of bitterness against unfriendly reviewers and a profusion of abusive epithets which by withdrawing attention from the argument do harm instead of good. He argues throughout from a legal point of view, taking the position that all botanists should be firmly bound by the Paris Code, until that code itself shall be rejected or altered by a thoroughly representative congress. In this light his arguments are fairly consistent, but it is a fact which no one can deny that quite a number of influential botanists did not fully agree at the time with the Paris Code, and that the practice of many others has diverged quite widely from it. So far in the world's history a law is respected in direct proportion to the power for its enforcement. At present this power does not exist, and can only come by organization and the election of delegates who shall represent all botanists and be able to make rules acceptable to the greatest number.

The numerous signs proposed for use in an international system of botany would be a tax upon memory which most botanists would find very wearisome.

The last thirty-three pages are occupied by a "Codex Nomenclaturæ Botanicæ emendatus ab. Otto Kuntze," printed in parallel columns in German, English, and French. It is founded on the Paris Code, but with many alterations often to its improvement. A few extracts will serve to show the spirit of these:

"New names based on synonyms are sufficiently characterized by the synonyms" [but in such cases the synonyms should always have been well characterized].

"A deviation from strict priority is necessary for genera published on the same day and united afterward." (The genus first receiving species after 1753 to be valid.)

"The annulments and alterations of the existing laws shall have no retroactive force and shall be applicable only to new or subsequently renewed denominations after the date of the publication of the resolution concerned passed by the competent

congress. Names before that date shall be entitled to admission."

"Names of genera or species or varieties which after 100 years since their establishment have not been renewed by other botanists shall be prohibited to be renewed in the future" [half that time would seem to be quite sufficient].

"Existing homonyms invalidate such homonyms as are in future competitory or newly established or renewed." [The author has no patience with the "once a synonym always a synonym" rule as a retroactive measure.]

It plainly appears from the above that the author is not without some sensible ideas. It is evident, however, that he needs an English editor in spite of his conviction to the contrary, and the following clause is so extraordinary that it seems hardly possible it can have emanated from a sound mind.

"*Transitory Article.* The generic names proposed by Dr. Otto Kuntze for the new starting-point of nomenclature shall be valid according to the former articles, 1–68. The species-names thereto, as may be found in his Revisio generum plantarum, shall be combined with his proposed acceptable genera, and the combinations of all such names shall be provided with his responsible author's quotation.

"Any editorial alterations shall be reserved to Dr. Otto Kuntze, subject to the consent of the next congress." K. B.

REVIEWS BY THEO. HOLM.

B. RENAULT: *Lycopodiopsis gen. nov. an arborescent Lycopodiaceous plant.**

The present paper is based upon material from the carboniferous formation in Brazil, collected near Piracicaba in the province Santo Paulo.

While these specimens showed several features in common with the genus Lycopodium, the author has observed some divergences, which have seemed to make necessary the establishment of a new genus "*Lycopodiopsis.*" It might be noted, that this plant occurred with some Conifers, Cordaites, Praronius and

* Notice sur une Lycopodiacée arborescente du terrain houiller du Brésil. (Société d'hist. nat. d'Autun. Vol. 3, p. 109–125.)

relics of a reptile, the Stereosternum of Cope. The material consisted of some fragments of a stem, which showed numerous scars from leaves in dense spirals. A transverse section was also obtained of the stem itself; but no organs of fructification were to be found.

The author compares the shape and the arrangement of the leaf scars of this plant with those of others from the same formation, such as Praronius, Lepidodendron, Lepidophloios and various representatives of the Sigillariaceæ, and finds a certain accordance to those of the Lycopodiaceæ. A similar study has been made of the anatomical structure of the stem, which in several respects does not correspond to that of a Lycopodium. This is for instance well marked by the presence of a distinct pith in the Brazilian plant, besides that the mestome-bundles are moved towards the periphery. It might also be objected for the identification of our plant as belonging to the Lycopodiaceæ, that there is a considerable cork developed. But we might, on the other hand, take into consideration, that during the carboniferous period the trees showed constantly a heavy layer of this tissue on account of their exposure to frequent changes of dry or moist atmospheres.

Two species of *Lycopodium* are known from the same formation namely *L. punctatum* B. R. and *L. Renaulti* Brongt., but the author has preferred, as stated above, to consider this plant as representing a new genus *Lycopodiopsis*, species *Derbyi* B. R.

H. ENGELHARDT: *Cretaceous plants from Bohemia.**

The comprehensive studies of Velenovsky upon the cretaceous flora of Bohemia have already called attention to the numerous interesting types, that occur in this flora. It was, especially, these previous works, that induced the author of the present paper to study a collection of plants from the same formation in Bohemia, which had not been examined by Velenovsky. Several species are enumerated in this note and the author gives a very complete synonomy of each species with references to the litera-

* Ueber böhmische Kreidepflanzen aus dem Geologischen Institute der Deutschen Universität, Prag. (Mitteilungen aus dem Osterlande, Vol. 5, New Series, Altenburg i. S.—A. 1892, p. 86. One plate.)

ture, besides describing and figuring some species, which are considered as new to science. These are as follows: *Sphærococcites Laubei* of the Algæ, *Litsæa bohemica* of the Lauraceæ, *Proteoides Reussi* of the Proteaceæ and *Callistemophyllum Bruderi* of the Myrtaceæ.

The ferns are represented by the genera Mertensia, Thyrsopteris, Pteris and Asplenium. Seeds were found of Cycadeospermum, by the author referred to a new species *C. turonicum*, while Sequoia, Widdringtonia and Pinus were among the Conifers. The dicotyledons were represented by species of Ficus, Laurus, Dryandra, several interesting species of Aralia, besides Hedera, Credneria, Magnolia, Bombax, Sterculia and Eucalyptus.

H. B. GEINITZ: *The fossils of Sachsen-Altenburg.**

Animals and plants are enumerated in this paper as they have been discovered in the various geological formations of Sachsen-Altenburg. We will merely consider the plants, of which specimens are noted from the Devonian to the Tertiary formation. Chondrites and Harlania are mentioned from the Devonian, Calamites from the Carboniferous, Palaeophycus, Sphenopteris, Ullmannia and Voltzia from the Zechstone-formation, while a considerable number have been noted from the Tertiary and the "Braunkohl" layers. Among these are a few Cryptogames namely Sphaeria and Lygodium, some Palms and Conifers, the last of which are placed under Dicotyledones! It may be noted at the same time, that the Najadaceæ are enumerated under the same group, the dicotyledoneous plants, and that Nyssa is placed under Santalaceæ, which misprints seem to have been overlooked.

The number of species is relatively very small, although several of the large genera have been discovered, such as Quercus, Ficus, Eucalyptus, Juglans and Carya.

B. RENAULT: *Retinodendron Rigolloti nov. gen.*†

It is a marked characteristic of the plants from the permo-

* Die Versteinerungen des Herzogtums Sachsen-Altenburg. (Mitteilungen aus dem Osterlande, Vol. 5, New Series, Altenburg i. S.—A. 1892, p. 161.)

† Sur un nouveau genre de tige permo-carboniferè, C. G. Retinodendron Rigolloti. (Comptes Rendus hebdom. d. séances de l'Acad. d. sc. Vol. cxv. Paris, 1892 p. 339.)

carboniferous formation, that they possess reservoirs of tannin or various mucilaginous matters, besides resiniferous ducts in great abundance. This is the case for instance in Sigillaria, the bark of which shows numerous secreting ducts; in the petioles of Myelopteris which are almost perforated by gum-ducts; in the leaves and branches of the Dolorophylleæ, where each mestome-bundle is accompanied by numerous ducts; and in the outermost layers of the bark in Colpoxylon, Medullosa and Cycadoxylon which show the presence of a very large number of gum-reservoirs. Such examples might easily be multiplied A very interesting addition to this flora of the permo-carboniferous formation is the new genus Retinodendron, which the author describes in the present paper.

The material, upon which the genus has been established, was collected near Autun, in France, by Mr. Rigollot. It consisted of a stem, of which only the inner part was preserved; the bark was, unfortunately, wanting. The author succeeded, however, in identifying the family to which this stem belonged, and he has referred it to the Gymnospermæ on account of the structure of the hadrome.

The leptome showed the singular fact, that certain parts were composed of several concentrical zones of gum-ducts and sclerotic cells in regular alternation with each other. The content of these gum or probably resin ducts was a brown and somewhat granular substance. The ducts themselves were surrounded rounded by a sheath of thin-walled cells, around which another sheath was formed of similar cells, the walls of which showed some kind of irregular perforation. This first zone of gum-ducts included about fifteen concentrical rows, but outside this was a second zone, consisting of twenty-four rows of similar ducts; thereupon followed a circle of sclerotic cells, after which again a third zone of more than fifty concentrical layers of the same gum-ducts, as described above.

This very regular arrangement of the ducts and sclerotic cells reminds one of the *Poroxyleæ;* but in the latter it is the sieve-tubes and parenchymatic cells, which show this regular arrangement.

B. RENAULT: *The Botryopterideæ.**

The representatives of this family are especially characterized by the leaves, which usually are destitute of any blade, and the organs of fructification are therefore to be found at the apex of the nerves, thus resembling the species of Thyrsopteris and Osmunda. The sporangia are large, 2 mm. in length, their form varying from oblong to pyriform, or sometimes semilunar, circular, or polyëdric; their membrane consists of two distinct layers of different structure. The spores are present in large number, and show various forms, some being round with smooth surface and showing the three radiating lines, which are characteristic of the macrospores; some others are polyëdric, but have not the radiating lines.

These plants seem to have been herbaceous or frutescent, and to have grown in the water, sometimes even submersed. They resemble Osmunda in regard to their habit, but they seem, however, to represent a family, which is well distinguished from the ferns. It is a family that existed already in the Permian-formation, and the numerous specimens which have been obtained were so well preserved as to enable us to establish several genera. These genera are based upon the various forms of the mestome-bundles of the rachis, considered in transverse sections. Following forms are to be distinguished: The "sword-shaped" in Clepsydropsis, the "H-shaped" in Zygopteris, the "ω-shaped" in Botryopteris (showing a form like the Greek letter ω), and finally the "linear" in Grammopteris. The name "Botryopteris" does not indicate the corresponding form of the mestome-bundles as in the other genera; the name has been chosen from the fact that this genus was the very first one in which were observed the large sporangia, united into voluminous masses and botryoidally arranged. The author gives, also, a very complete description of these genera and their respective species.

M. MÖBIUS: *Australian fresh-water Algæ.*†

This paper is based upon a collection of fresh-water Algæ which were collected by Mr. Bailey near Brisbane, in Australia;

* Note sur la famille des Botryoptéridées. (Société d'hist. naturelle d'Autun, Vol. 4. p. 349-373.)

† Australische Süsswasseralgen. (Flora, 1892. p. 422-450. 22 figs.)

it includes Florideæ, Chlorophyceæ and Phycochromophyceæ, while the Diatomeæ have not yet been identified. The author calls attention to the fact that no species was observed of the genus Cladophora, although *Cl. gossypina* Kütz is reported from Adelaide, and *Cl. Wollsii* Sond. from the Parramatta River. It is also strange that the Characeæ were entirely absent, since this family is very well represented in New Zealand according to Nordstedt. *

Four species are described and figured as new to science: *Coleochæte Baileyi*, *C. conchata*, *Stigeoclonium australense* and *Scytonema subtile*, besides a number of new varieties. The paper contains many critical notes and gives the geographical distribution of all the species in question.

F. HEYDRICH: *Algæ from New-Guinea.*†

A large collection of salt-water Algæ from New-Guinea, made by Capt. Schneider in the year 1891, has been identified by the author, who enumerates the species in the present paper. Several species of Cyanophyceæ, Chlorophyceæ, Phaeophyceæ and Florideæ are enumerated, and additional notes are given as to the literature and the geographical distribution of the species. The following are described and illustrated as new to science: *Oscillaria microscopica*, *Ectocarpus elachistæformis*, *Streblonema minutula*, *Zonaria parvula* Grev. var. *duplex* and *Bostrychia crassula*.

G. DE LAGERHEIM: *Trichophilus Neniæ.*‡

It is a fact of great interest, that certain Algæ live exclusively upon live animals. Some of these are true parasites and very injurious to their hosts, while some other ones are merely epizoic. To the last category belong for instance: *Cladophora ophiophila*, which grows upon Herpeton, Characium upon Entomostraca, Cyanoderma upon Bradypus, etc. The author has, however, discovered a species of Tricophilus growing

* Australasian Characeæ. Berlin, 1892.

† Beiträge zur Kenntniss der Algenflora von Kaiser-Wilhelms-Land (Deutsch-Neu-Guinea.) (Berichte d. deutschen botan. Gesellsch. Vol. x, Heft 8, Berlin, 1892, pp. 458-485, 3 plates.)

‡ *Trichophilus Neniæ Lagerh.* n. sp. eine neue epizoische Alge. (Berichte d. deutsch. botan. Gesellschaft, Vol. x, Heft 8, Berlin, 1892.)

upon the shell of Nenia, where it formed deep-green spots and was very conspicuous. This species, which shows several differences from *T. Welckeri*, hitherto the only know species of this genus, is described as new and named *T. Neniæ* Lagerh; it was collected in Ecuador.

It seems more than probable that the occurrence of these Algæ upon living animals is a matter of protection; we remember for instance the numerous constellations that occur on the bottom of the sea, where Crustacea: Hyas and others are walking around, covered with a whole forest of Algæ, Hydrozoa, etc., so that the Hyas itself is hardly visible.

G. DE LAGERHEIM: *The glacier-flora in Ecuador.**

The summits of all the higher volcanoes of Ecuador are covered with snow, which persists through the summer. This snow is hard like ice, but is, nevertheless, inhabited by a flora, of which the author gives a very interesting sketch in the present paper. It was especially some earlier investigations upon the same flora, but from collections made in the arctic region, which induced the author to secure material from the volcanoes in Ecuador; these earlier studies were made by Berggren and Wittrock, and by the author himself.

The material was collected upon the snow, which showed the well-known phenomenon of having a deep pink color, the so-called "red snow," and the author enumerates several cryptogames, especially Algæ, as representatives of this singular vegetation.

Chlamydomonas sanguinea, *C. asterosperma*, *C. glacialis*, *Raphidonema nivale*, *Selenotila nivalis* are described and figured as new, and the species of *Chlamydomonas* were the most frequent forms in the red snow. Some other genera were also represented, as for instance: Bichatia, Nostoc, Navicula, Mesotænium, Gloeocystis and others. Of Fungi were observed Chytidrium and the new genus Selenotila, while *Philodina roseola*, which occurred together with the red Chlamydomonades, was the only representative of the animal kingdom.

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* Die Schneeflora der Pichincha. Ein Beitrag zur Kenntniss der nivalen Algen und Pilze. (Berichte d. deutsch. bot. Gesellschaft, Berlin, 1892. Vol. 10, Heft 8, p. 517.)

NOTES AND NEWS.

Mr. O. T. Baron, whose collection of humming-birds has been placed in the museum of the Hon. Walter Rothschild, has again started for South America for the purpose of making collections of small birds, mammals, and insects.

A new publication, *Novitates Zoologicæ*, is to appear from the museum of the Hon. Walter Rothschild, Tring, England, in January, 1894. It will be issued in parts at irregular intervals during the year, making an annual volume of 400 to 600 pages.

Mrs. Katharine Brandegee, returning from Baja California, with the botanical and zoological collections made by Mr. Brandegee and Dr. Eisen during the month of September, was shipwrecked off the coast of California, near San Pedro, in a dense fog, on the night of October 14th. The collections escaped injury.

In the course of a review of Index Kewensis by the editor of the London Journal of Botany, some remarks are made which may be of use in helping us to "see ourselves as others see us." "The aim is to record every genus and species of phanerogams published before the end of 1885—a date which, fortunately for the compiler, precedes the eruption of neo-American nomenclature, which is still raging almost unchecked." "His care throughout has been to avoid the necessity of causing himself to be cited as the authority for any combination of names; and in this he contrasts favorably with too many modern writers, especially in America, whose often ill-considered resuscitation of disused names seems to have been actuated by a 'desire to obtain a cheap notoriety by making new combinations.' Changes of nomenclature on a large scale should be left to the monographers of genera, and Mr. Jackson has acted with judgment as well as with modesty in not attempting them."

The genus Agoseris Raf. into which the species have all been transferred from Troximon both by Professor Greene and by Otto Kuntze, appears to have been taken up before. The Kew Index cites as synonyms of species of Troximon, *A. cuspidata*

Steud., *A. glaucus* Steud., *A. parviflora, rosea, & taraxacifolia* D. Dietr.

HALESIA L, a genus of three species inhabiting the southeastern United States, is now undergoing the miseries of nomenclatural reform. There was a *Halesia* Browne, published four years earlier than the one of Linnæus, and although the earlier one is only a synonym of Guettarda, it is raked out of its grave in order to destroy by the " once a synonym always a synonym " process the commonly and long-accepted *Halesia* of Linnæus.

Dr. N. L. Britton, noting the opportunity, in "Garden and Forest" for October 18 inflicts the name "*Mohria*" on a suffering science, as a substitute for *Halesia* L. and duly transfers the species.

Professor Greene, in his Journal "Erythea" of November 3, with his customary happy knack of making every possible blunder, accuses Professor C. S. Sargent of creating the name "Mohria" and proposes "Carlomohria" as a substitute, "vouchsafing" the information that "Mohria" as a spoken name is identical with "Morea," a name already twice employed.

In the meantime Dr. Britton having discovered that there is a recognized "Mohria" among the genera of ferns, invents a new generic name "Mohrodendron" and in Garden and Forest, November 8, again transfers the species.

Halesia in this way has been "honored" in three weeks' time with three new generic names and two sets of binomials, which the botanical world will promptly add to the "ever increasing store of silent synonyms."

"MR. JACKSON'S great *Index* continues to progress steadily and with as much rapidity as the nature of the work will allow. It is now printed off as far as the beginning of E; up to the end of D it occupies 807 quarto pages of three columns each."—Lond. Journal of Botany, March, 1893.

"Part I of the Index Kewensis, dealing with the nomenclature of all known flowering plants, has just been issued in London. It had been confided that such a work was in progress at the Kew Herbarium, and the promise of its publication excited

curiosity and interest in many quarters."—Erythea, August 1, 1893.

"Professor E. L. Greene tells us, in *Erythea* for August, that 'Part I of the *Index Kewensis* has just been issued in London.' We in London have not yet heard of the publication of Mr. Jackson's great work, with the progress of which the readers of this Journal have been kept tolerably well acquainted."—London Journal of Botany, September, 1893.

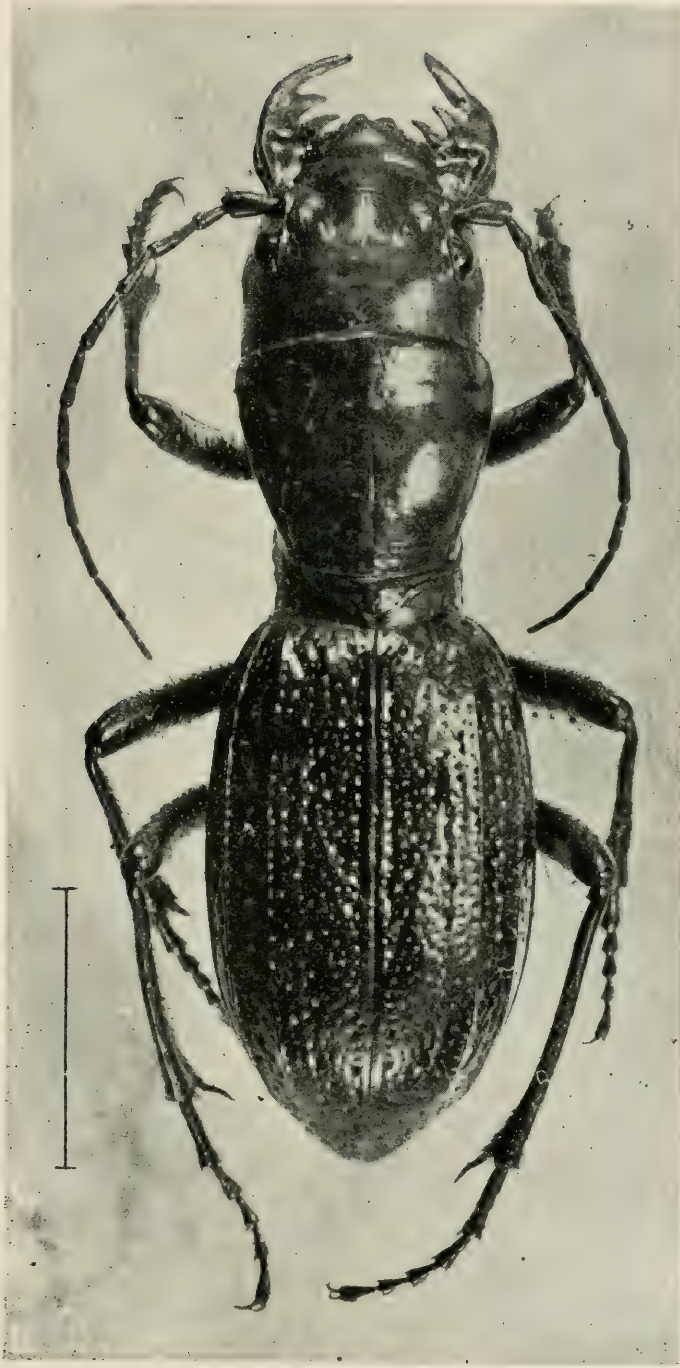
"At least as early as the tenth of July, 1893, a prospectus was circulated in London announcing as 'just ready' Part I of the long-expected Index Kewensis. As a matter of fact it was not ready. The prospectus was, however, shortly on its way to America, and the August number of ERYTHEA announced in 'Notes and News' the publication of Part I of the work. This was contradicted in the London *Journal of Botany* for September, and we were further informed that the readers of that journal were kept tolerably well acquainted with the progress of the Index. We were left to infer that the Index was not out; was not even expected, for the prospectus seems not to have been heard of there. Another month passed. The October number of the journal reviewed the Index Kewensis, Part I. The prospectus had finally come to the light of the astute London editor, and its premature circulation was set down as a fault of Kew, and not due to any creative imagination on the part of the editors of ERYTHEA. * * * Furthermore the editor, in his eagerness to locate responsibility for news notes in ERYTHEA does not guess at all well. He should confine himself to berating the Kew people, which is his forte.—W. L. J."—Erythea, November 3, 1893.

The second part of the *Index Kewensis* has been passed for press and may be expected very shortly. This concludes the first of the two volumes and brings the enumeration down to the end of J (Justicia). So far the work occupies 1268 pages.—Lond. Jour. Bot., November, 1893.

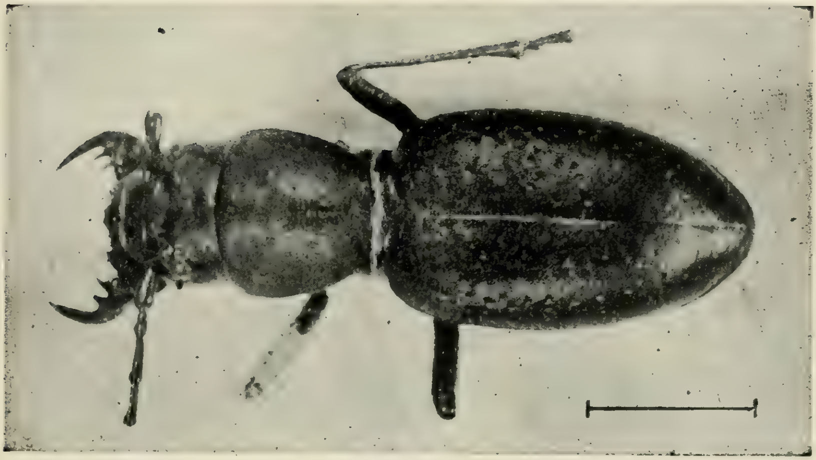
The editor of the London Journal of Botany in the course of a caustic notice of Conway McMillan's "Metaspermæ" makes some remarks which do more than justice to the neo-American reformers. He says: "The 'Botanical Club of the American

Association for the Advancement of Science' has decided otherwise; to such an authority even Mr. Macmillan, albeit reluctantly, must needs bow; and *Taraxacum Taraxacum* with its numerous analogues passes into that limbo which is largely peopled by the unhallowed creations of American reformers. With these go a large number of galvanized corpses * * * for the Botanical Club, which shows distinct signs of sanity in its mode of dealing with these questions, accepts 1753 as the date for genera." The editor will be obliged to retract some of his belief as to the Club's glimmerings of sanity, for at the last session it rescinded its previous action concerning double names and indorsed Mr. McMillan's practice.

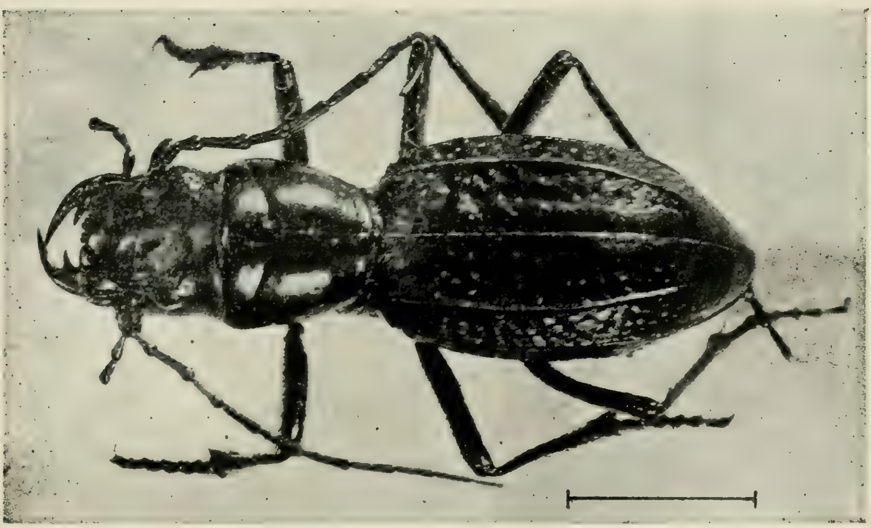
Concerning Jacksonia he says: "*Jacksonia* of Rafinesque is one of Professor Greene's numerous restorations, and with his usual promptness in enriching nomenclature he at once ran out four species, but *Jacksonia* has since received its *coup de grace* from Dr. Britton * * * We may be thankful that Dr. Britton's exposure came in time, as I believe it has done, to prevent the substitution of a new name for the well-known *Jacksonia* of Brown." The editor has herein done gross injustice to Professor Greene in underrating the alacrity with which he seizes such opportunities. "Erythea" for May, 1893, contains a list of thirty-six species, all except the first one transferred from Jacksonia to Piptomeris and credited to himself.



A. CYLINDRIFORMIS SAY.



A. BARONI RIVERS.



A. PICOLOMINNII REICHE.

ZOE
A BIOLOGICAL JOURNAL

VOL. IV. JANUARY, 1894. NO. 4.

NOTES ON A COLLECTION OF MAMMALS FROM THE SIERRA NEVADA MOUNTAINS.

BY WILLIAM W. PRICE.

In the summer of 1892 the writer made a trip into the higher Sierra Nevada Mountains, during which he secured for the Leland Stanford Jr. University the small collection of mammals on which the following notes are based. The collecting was done chiefly in three different localities; namely, at Red Point and at Summit Station, in Placer County, and on Mount Tallac, in El Dorado County.

The topography of the country, hastily sketched, is as follows: Red Point is at an altitude of about 4500 feet, on the Forest Hill Divide—a tongue of land lying between the North and Middle Forks of the American River. Heavy forests of sugar and yellow pines, fir, spruce, and cedar clothe the ridges; the undergrowth is composed chiefly of several species of Ceanothus, manzanita, and scrub oak.

The open, brushy tracts on the top of the ridge are the favorite haunts of the long-eared chipmunk, *Tamias macrorhabdotes*. The California ground squirrel, *Spermophilus grammurus beecheyi*, which has here about reached its vertical limit, is common on rocky hillsides. Two other squirrels, the California gray squirrel, *Sciurus fossor*, and the California chickaree, *Sciurus hudsonius californicus*, are found everywhere in the timber though preferring deep hillside forests.

Summit Station, the highest point on the Central Pacific Railroad, is about 7000 feet above the sea. On the east the mountains descend abruptly toward Donner Lake, but westward the slope is much more gradual. A broad, grassy valley, the head waters of the Yuba River, takes its rise

December 21, 1893.

at the summit. The chief timber is the tamarack pine, *Pinus contorta*, which still forms heavy forests along the sides of the valley though much of it has been cut away since the coming of the railroad. On the high ridges, a thousand feet above the valley, are found scattering groves of a beautiful fir, *Tsugo Williamsonii.* Along the stream which wanders through the valley grow thickets of a dwarf alpine willow and alders; often about these in the grass were runways of meadow mice or voles. It was in this valley that I first found the curious alpine spermophile, *Spermophilus beldingi.* The gilded chipmunk *Spermophilus chrysodeirus* was also abundant in the rock ledges.

Mt. Tallac, about which the greater part of the collection was made, is nearly 10,000 feet in altitude and lies a few miles southwest of Lake Tahoe. The western slope is not precipitous like the eastern side, and is well timbered in places, chiefly with tamarack pine, a few groves of Williamson's fir and *Pinus flexilis*, the latter a dwarf snow-crushed pine, bearing five leaves and small purple cones, and found only on the highest peaks and ridges. There are many boggy springs along the mountain slope, about which flourish alder and willow thickets. It was in these places that I found the only traces of the weasel, *Putorius arizonensis* (?). Several mammals, including the gray-headed pika, *Lagomys schisticeps*, the yellow-bellied marmot, *Arctomys flaviventer*, and two or three species of *Tamias*, were found commonly high up among the rocks.

From Mt. Tallac I made a hasty three days' trip into the Carson Valley, Nevada, obtaining there specimens of *Arvicola* and *Tamias.* A large hare, *Lepus texianus*, and the antelope squirrel, *Spermophilus leucurus*, were common on the sage plain east of the valley; along the eastern base of the Sierra Nevada I saw several specimens of a large bushy-tailed spermophile which was probably *Spermophilus grammurus.*

I failed to obtain specimens of many common species, either through lack of time or accident; these species with others commonly known to the trappers will be enumerated at the close of the list. I have taken advantage of the identification by Dr. J. A. Allen of some of this material submitted to him by the Museum, and I am also greatly indebted to Prof. C. H. Gilbert and

Mr. W. E. Bryant for aid of various kinds in the preparation of this paper. The numbers used throughout the paper are the serial numbers of the mammal collection in the University Museum.

1. *Tamias quadrimaculatus* Gray.

This species, of which six specimens were taken, was found only at two localities, Summit Station and on Mt. Tallac. They are all in worn pelage, having not yet attained their fall coat, but all show on the flanks, patches of rich ferruginous that cannot be mistaken. The series varies somewhat in intensity of color, although they were all collected within a period of three weeks. Two specimens, No. 51, a male, taken July 31, and No. 97, a female, taken August 12, on Mt. Tallac at about 8500 feet elevation show the highest coloration. In one specimen, No. 66, a male, nearly all the outer coat has been shed, leaving the soft black under pelage, through which the new hairs of the stripes are beginning to show.

Little is known of either the horizontal or vertical distribution of this species. It is considered by Dr. Allen a Sacramento Valley form, and is recorded from the following localities: Nevada City, Nevada County; Fort Crook, Shasta County; Baird, Shasta County; Mt. Shasta, Lassen County; and from Fort Klamath, Oregon. As is readily seen, none of these localities are in the Sacramento Valley. They are all in the lower portion of the pine belt which covers the western slope of the Sierras down to an altitude of about 1500 feet in the Mt. Shasta region and to about 2500 feet in Central California. The discovery by the writer that *Tamias quadrimaculatus* inhabits the upper slopes of Mt. Tallac was unexpected, and goes to show that from Nevada City northward this species probably inhabits the entire western slope of the Sierra down to the limit of evergreen forests. Its extension southward is still unknown.

Gray's type of *Tamias quadrimaculatus* came from Michigan Bluff, which stands at an elevation of 3500 feet, some fifteen miles in a direct line due south of Blue Cañon, and about half that distance from Red Point. The three localities present similar conditions, standing at approximately the same elevation, and all included in the great belt of yellow and sugar pine.

When it is recalled that at Red Point and Blue Cañon, *Tamias macrorhabdotes* only, seems to occur, it appears probable that this is the only species, or at least the most abundant one to be found at Michigan Bluff also. In connection with this we have the fact that neither in the original description of *T. quadrimaculatus*, nor in Thomas's later notes to Dr. Allen concerning the type specimen, is there anything characteristic. It is thus seen that Dr. Allen's first impression that Gray's species should be identified with *T. macrorhabdotes* has the probabilities greatly in its favor. Until the original type is more critically re-examined, or until Michigan Bluff is explored, it may be as well to follow Dr. Allen in identifying *T. quadrimaculatus* with the species here so designated.

2. *Tamias macrorhabdotes* Merr. Long-eared Chipmunk.

Eleven specimens taken in the neighborhood of Red Point are all distinctly referable to this species, and show but little variation. All were taken in late June or early July and are in breeding pelage. Several of the females were nursing and one or two contained small embryos.

The long-eared chipmunk is pretty well distributed on the Forest Hill Divide, and chipmunks supposed to be of this species were seen at altitudes varying from 3000 to 5500 feet. On top of the Divide a mile or two from Red Point is a fire-swept stretch of woods, with charred bushes and logs and trees both living and dead. The soil is a rich sandy loam supporting many species of flowering plants. In this locality the long-eared chipmunk is especially abundant. Sometimes a dozen could be seen at once playing on the logs and charred trees or scratching in the dust. My observations confirm those of Mr. C. A. Allen, who says that this animal is almost exclusively terrestrial, and that if it is surprised while on trees it will try in every way to reach the ground unseen and hide in holes or rubbish heaps. I have often seen it high up on trees, where it very skillfully reached the ground without being seen by descending the opposite side. It has the usual shrill note of alarm, somewhat louder than those of other species I have met.

3. *Tamias senex* Allen. Gray Chipmunk.

Three specimens of this chipmunk captured on Mt. Tallac

were the only ones secured. They were taken at a little over 7500 feet elevation, among bushes and granite boulders along the western slope of Mt. Tallac. I do not remember seeing any at Summit Station, the type locality of the species, but several large gray chipmunks were seen at the foot of Donner Pass, along the western end of Donner Lake. Their size was noticeably greater than that of the smaller chipmunks, *amœnus* and *frater*, which I had been collecting on the summit.

Of three specimens two are adult females collected August 4 and 12, apparently just beginning to moult. The other, taken August 12, is a young male, nearly full grown and somewhat richer in coloration.

4. *Tamias amœnus* Allen. Klamath Chipmunk.

Of the seven specimens of *Tamias* referable to this species, three were taken at Summit Station and four on Mt. Tallac. They are mostly in ragged pelage, and some seem to approach *Tamias frater*, though in all the specimens the pale buff base of the hairs on the upper surface of the tail is enough to distinguish them easily.

This is the smallest species of *Tamias* collected in the Sierra Nevada; two specimens, No. 58 ♂, and No. 62 ♀, were collected on bare rocks on Mt. Tallac, at 9500 feet elevation. It was found on trees, on the ground, and among rocks. Numerous small chipmunks were seen on a rocky, scantily-wooded hillside some miles west of Summit Station and at about 1000 feet lower altitude, but as no specimens were taken, they might have been either *amœnus* or *frater*.

5. *Tamias frater* Allen. Sierra Nevada Chipmunk.

Seven specimens of this form were taken, five at Summit Station and two on Mt. Tallac. These, like most of the other chipmunks collected in the Sierra Nevada, are in transitional pelage and consequently very difficult to determine. Some approach exceedingly close to *Tamias quadrimaculatus* in coloration. The habits of this species appeared similar to those of *T. amœnus*.

6. *Tamias minimus pictus* Allen. Desert Chipmunk.

This species was found only in the Carson Valley, Nevada. It was common in the sage brush, sometimes a long distance away

from trees, but it was particularly abundant in brush heaps, old lumber piles, and was common on fences. The two specimens taken on August 9 were caught in a cavity between a fence-board and post. They were male and female, adults, and in excellent breeding pelage.

7. *Spermophilus chrysodeirus* Merr. Gilded Chipmunk.

Animals of this species seemed abundant above 6000 feet on the west slope of the Sierra and at a lower altitude on the eastern slope. They were first seen on a rocky hillside near Cisco, a station on the Central Pacific Railroad below Summit Station. Afterwards they were found commonly at Summit Station, along the Truckee River, on Mt. Tallac, and on a spur of the Sierra, skirting the east shore of Lake Tahoe and sloping down to the Carson Valley. They prefer open hillsides thinly grown with pines and most frequently make their burrows beneath rock piles and ledges. They seem to be entirely terrestrial. I did not see one on trees and bushes. They feed on various grasses and flower-seeds and probably also on the seeds of the fir and pine.

Twenty specimens show a large amount of seasonal and individual variation. No one feature appears to be constant. The dorsal stripes vary in length, breadth, and intensity of color. In six specimens only can the white stripes be traced as far as the base of the tail; they also extend forward and blend into the golden yellow of the shoulders and post-auricular patches. In one specimen, No. 72, a female, the post-auricular patches are nearly white, and others show a complete gradation to the rich golden brown of the most highly colored specimens. The shoulders vary in color from a tawny iron-gray to the deepest orange. The color of the central area of the under side of the tail varies from pale orange to deep chestnut, and the tips of the fringing hairs from silvery gray to ochreous. A young specimen about two-thirds grown, taken August 6 on Mt. Tallac, is not so bright as the adults. In it a leaden gray suffuses the lower parts and extends well up on the sides, while the crown-patch, shoulders, and post-auricular regions are only softly tinged with ochreous.

8. *Spermophilus beldingi* Merr. Belding's Spermophile.

This short-tailed spermophile is one of the most conspicuous

mammals of the high Sierras, sharing that distinction with the marmot, *Arctomys flaviventer*, and the gilded chipmunk already mentioned. It was especially abundant in colonies of half a hundred or more in the grassy valley at Summit Station. Other colonies were seen about Mt. Tallac and Pyramid Peak, always on grassy flats and gentle hillslopes.

They are short, thick-set little rodents and have a peculiar loping gait. They have the habit of sitting up on their haunches when alarmed, shared by other members of the genus. This habit has given them the local names of "picket-pins," "prairie dogs," and "woodchucks," though the latter name is more generally applied to the marmot. They often wander some distance away from their burrows. I have seen a grassy meadow covered with them feeding on grass seeds; when alarmed the whole company would rush loping to their homes. Several shot at Summit Valley had their cheek-pouches distended with the green seeds.

A series of fifteen skins shows little color variation, and that confined to the dorsal stripe and the fulvous wash of the underparts. Some young specimens, a week or two old, taken July 21 at Summit Station have nearly the exact color pattern of the adults. Another, perhaps six weeks old, taken August 12 on Mt. Tallac, is paler in color, the crown patch and dorsal stripe are faint, and the under parts are bluish gray, the color extending up on the sides.

9. *Spermophilus grammurus beecheyi* (Rich.) California Ground Squirrel.

A single specimen was taken near Red Point. Ground squirrels are common in the Sierra Nevada up to nearly 6000 feet. Higher than that they give place to the marmot, and the smaller spermophiles, *Spermophilus beldingi*. They frequent rocky hillsides, and though common they are shy and not nearly so conspicuous as in the valleys of California.

10. *Sciurus hudsonius californicus* Allen. California Chickaree.

Only three specimens were taken, two at Red Point on July 6 and one at Summit Station July 30. Several others were seen; one along a road beside Lake Tahoe, appeared to be in the black stage. My companion remarked: "That's the first *black* squir-

rel I've seen in California." At another time a pair came close into camp high up on Mt. Tallac and fearlessly picked up some bits of bread. This species ranges higher in the mountains than *Sciurus fossor*, appearing to inhabit the Sierra from about 2500 feet up to 9500, or as far as timber extends. It delights in heavily wooded slopes filled with dense undergrowth. Its loud chattering call notes were commonly heard about Red Point, though always in almost impenetrable places.

The three specimens present no marked variation. The black lateral stripe separating the gray of the dorsal region from the white of the under parts is conspicuous in each, and the bright orange on the upper surface of the feet is also present. They are each in transition pelage, patches of new hair lying side by side with the old.

11. *Sciuropterus volucella hudsonica* (Gmelin). Northern Flying Squirrel.

A single caged specimen was given to me at Red Point. This was the only one seen though I was told they had been very numerous there the winter previous. They frequented a feed stable and barn, and became very troublesome, gnawing into sacks and destroying the grain. Many were caught in box traps but they continued to increase until some cats were placed in the barn, which routed them. Some time after, when sweeping out the place, two dozen squirrels' tails were picked up. The winter was a severe one, and plenty of food at the barn had called them from a long distance. I was told by woodcutters that sometimes in felling a tree, especially if the top was broken and bushy, some of these little animals would soar down from the top just before it fell and alight on another tree, running up quickly to the higher branches. During forest fires, which often sweep over the mountains, the flying squirrel with other animals as rare are sometimes seen. In traveling through the mountains I have asked many people about this interesting little rodent, but only a very few had ever seen it and many had never heard of it at all. Its nocturnal habits, of course, make it seem rare, but judging from the numbers found in the barn at Red Point it surely must be much more common than it is supposed to be.

12. *Arvicola* sp.? Meadow Mouse.

Three *Arvicolas*, which I am at present unable to identify, owing to the unsettled condition of the genus, were taken in a hay field in the Carson Valley, Nevada, on August 9th. They are extremely abundant in fields in some parts of the Valley, and at times are very injurious to crops.

An *Arvicola*, probably a different species, was noticed in boggy meadows about Summit Station, on Mt. Tallac, and near Pyramid Peak. These animals had well-beaten runways and numerous holes, showing that a colony of several hundred lived together. Once in a bog at the base of Pyramid Peak one of these little animals stopped for a moment at the mouth of its burrow, thus giving me time to notice its dark coloration and small size.

13. *Sitomys americanus gambelii?* (Baird). Gambels' White-footed Mouse.

White-footed mice were observed at Red Point, Summit Station, and on Mt. Tallac. A single specimen, No. 3, a male, taken at Red Point on June 27, is darker in coloration than any of the adults from Mt. Tallac. A Sitomys, probably referable to this species, was captured at Summit Station, but the specimen was unfortunately lost. The series of eight specimens from Mt. Tallac show great individual variation. They range from bluish in the young to deep brown with a vinaceous tinge in the adults. One specimen, No. 47 ♀, is pale yellowish, resembling in color *Sitomys americanus sonoriensis*.

This species was noticed generally in dry pine woods and specimens were caught in traps baited with bits of bread and dried fruit; a single specimen was secured while turning over a log in search of beetles.

There is some doubt whether this species may not be the *Sitomys boylii* of Baird, which was described from a single specimen taken by Dr. C. C. Boyle in El Dorado County, on the Middle Fork of the American River in 1852. The description of *Sitomys boylii* is imperfect and the type specimen is faded and mutilated, so that it is impossible to find exactly what the characters of that species are, as noted by Dr. Allen in his recent review of some Californian Sitomys. My specimens, with one exception, were all taken at a high altitude. It is not known

whether the animal taken by Dr. Boyle, was high up on the mountains or down in the foothills close to the Sacramento plain; if the former, my specimens were from the neighborhood of the type locality.

The specimens here referred to were first identified by Dr. Allen as *Sitomys boylii*, but were later referred to *S. a. gambelii* and his identification is here followed.

14. *Neotoma cinerea* (Ord.) Bushy-tailed Wood Rat.

Found only at the Glen Alpine Sulphur Springs, on Mt. Tallac, where six specimens were secured. The species was said to be formerly abundant about the feed-stable and buildings of the resort, but had been nearly exterminated by cats about the place; when I arrived there appeared to be only one pair, with its young. On August 3 I trapped an adult male, and the same day one of the workmen brought me three young only a few days old. Later, August 12, I secured the female and another young one.

This species seems to have habits in common with *Neotoma fuscipes* of the interior valleys of California, especially the habit of carrying food away from cabins. An old miner told me that during the preceding winter these rats had taken possession of his cabin when he was away, and in a few nights had completely removed a sack of potatoes. Later he had found the greater part of the stolen goods in a hollow stump near his dwelling. I have also been told that these animals frequently bring back articles to replace the things stolen, and have from this habit been called "trading rats," but I have no proof of this assertion.

The six specimens vary in color. The adult male is dark gray above with faint shadings of brownish yellow along the sides, extending to the rump and for a short distance along the upper surface of the tail. The latter is dark gray for the most part, but is tipped with grayish white. The female of this species is a brownish yellow, richer along sides and on rump and shoulders. Below from nose to tip of the tail it is similar to the coloration of the male. The three young, collected August 3, are dark gray above, the color intensifying posteriorly until the lower back and rump are almost black. The brownish wash has begun to appear along the sides and about the shoulders. Below, along the median line, the pelage is pure white, but

blends into the gray of the sides. The young, collected August 12, is not so dark as the specimens taken on August 3, the gray having become clearer. There are also more pronounced traces of yellowish brown. Unfortunately I took no measurements and am unable to give comparative size.

15. *Thomomys monticola** Allen. Sierra Nevada Gopher.

Four specimens of this gopher, which proved to be new, were taken on Mount Tallac, at altitudes varying from 6500 feet, close to Lake Tahoe, up to 9500 feet near the summit of the mountain. The work of gophers was observed all over the high Sierras, especially in damp patches of vegetable mould about Summit Station, along the Truckee River, and on the grassy glades and slopes of Mount Tallac. On this mountain they were often noticed throwing up earth in the daytime and were especially abundant well toward the summit, often close to snow fields.

This gopher is characterized by a long and narrow skull, an exceptionally broad interparietal bone and very long and soft pelage. Above it is pale reddish brown, tinged with gray, and below, ashy white.

16. *Lagomys schisticeps* Merr. Gray-headed Pika.

Only two specimens of this curious little alpine rodent were secured; these were taken on July 28 among broken rocks on the very summit of Mt. Tallac. No more were seen in that locality, but on Pyramid Peak and on a rocky ridge near it they were abundant on August 5. It was late in the afternoon and the snow banks and tiny streams of water were freezing in shady places, but the little animals did not seem at all to mind the cold. They ran about over the rocks and snow beds and some had ventured a distance away from their homes and were feeding on a bright red alpine flower. Their sharp, squeaking cries were continually heard even after the sun had set. Several of their nests had little heaps of flower-stems and grass before the openings, and it may have been that even at this early date they were laying in their winter stores.

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* *Descriptions of Four New Species of Thomomys, with Remarks on other Species of the Genus.* By J. A. Allen, Bull. Am. Mus. Nat. Hist., v, p.48, April 28, 1893.

The only adult specimen, No. 42 ♂, is in worn pelage. The ends of the hairs are worn off along the back, leaving it dark brown in places. The young, No. 44 ♂, has long silky pelage of a grayish tawny color with interspersed black hairs.

17. *Scapanus townsendii* (Bach). Townsend's Mole.

A single specimen was taken at Red Point in a cellar. The marks of moles were seen all over the high Sierras especially about snow fields on Mt. Tallac, but no specimens were taken.

18. *Putorius arizonensis* Mearns. Arizona Weasel (?)

A Putorius, provisionally referred to this species, was taken high up on Mt. Tallac July 29. It was seen in a boggy piece of meadowland searching among dwarf willows. A few days later another specimen was seen in a similar place, but it was not secured.

The following is a list of the mammals seen or known to inhabit the Sierra Nevada, but no specimens were taken.

19. *Cariacus Columbianus* (Rich.) Black-tailed Deer.

This deer is common all through the mountains, in summer, up to 9500 feet. In the fall it migrates from the higher altitudes down to about 4500 feet and lower, but usually it is not found above that altitude in winter.

20. *Antilocapra americana* Ord. Antelope.

The antelope has been seen along the eastern base of the Sierra Nevada in the Carson Valley, but its range does not reach up into the mountains.

21. *Arctomys flaviventer* Aud. and Bach. Yellow-bellied Marmot.

Marmots were first seen near the Central Pacific Railroad at about 6000 feet. They were common about Summit Station and on the mountain sides along Donner Lake, frequenting granite ledges and rock piles. But on Mt. Tallac they seemed the most abundant, frequenting the slopes of the mountain from near Lake Tahoe to the very summit. About the summer resort at the Glen Alpine Springs, near the base of the mountain, they were abundant, and when everything was quiet about the place they often approached close to the kitchen in search of bits of vegetables

and refuse. Higher up on the mountain they were exceedingly abundant. On bright days a dozen or more could often be seen at once playing about logs and rock piles. They feed largely on grass and seeds; and down to certain meadows they had well-beaten trails leading from their homes in rock-ledges. I frequently found their burrows under stumps and the roots of trees. Judging from the number of entrances and the amount of excrement, several individuals occupied each den, and from appearances the dens had been inhabited many years.

The flesh of the marmot furnishes food to a large number of Nevada Indians who come up into the mountains for the summer months. They usually hunt with shotguns loaded with heavy shot, and catch the animals away from their dens by lying quietly close to them. During August the reports of guns on the higher parts of the mountain were continually heard, and an Indian has been known to secure two dozen in the course of the day. The flesh is said to be excellent eating and forms a delicacy at some of the resorts about Lake Tahoe.

22. *Spermophilus leucurus* Merr. Antelope Squirrel.

This animal was seen only in the sandy, sage-covered plains east of the Carson Valley, Nevada.

23. *Spermophilus grammurus* Say. Ground Squirrel.

Three or four individuals supposed to be of this species were seen along the base of the mountains west of the Carson Valley. They had burrows in the rocky hillside and allowed me to approach on horseback quite close to them.

24. *Sciurus fossor* Peale. California Gray Squirrel.

This species is common in the sugar and yellow pine belt along the west slope of the Sierras. It was seen on the Forest Hill Divide from about 2500 feet up to 5500. North of the North Fork of the American River, in the neighborhood of Blue Cañon, a few were noticed, but none were above the altitude of the sugar pine belt. In the neighborhood of Red Point they were generally distributed through the timber; their barking was frequently heard. Their chief food is the seeds of the sugar pine, *Pinus Lambertiana*, the largest and most beautiful pine in the Sierra Nevada. Under almost every tree are chips

which the squirrel has gnawed from the cones. He does not wait until the cone is ripe, but often gnaws the scales from the young cone while it is yet hanging on the tree. I have sometimes seen this squirrel hanging head downwards a hundred and fifty feet from the ground feeding on a cone. The gray squirrel does not hibernate, but usually descends lower in the mountains during the heavy snows. In the winter of 1891-92 I saw them frequently in the neighborhood of Blue Cañon running about over snow four feet deep. When chased they would not take to trees at once, but continued to run over the snow until closely cornered. Dogs are often used in winter to hunt them.

25. *Aplodontia major* Merr. California Sewellel.

This striking rodent was observed in the neighborhood of Red Point, and about a grove of big trees, *Sequoia gigantea*, about twenty miles southeast of Red Point, in Southern Placer County. Near Red Point two small colonies were seen in boggy land about springs. Both places were densely overgrown with brush and weeds. No specimens were taken here, but their presence was noted by freshly gnawed stems about their burrows. At the big tree grove a much larger colony was found. Their burrows were in the bottom of a ravine among dense beds of moss, thickly shaded with tangled bushes. A delicate mountain cranberry, *Vaccinium occidentale*, grew abundantly about the place, and little heaps of the stems, some with the berries still attached, lay scattered about the entrances to the dens. Large quantities of stems of *Ceanothus* and *Rhododendron* were found gnawed into lengths of about six inches. Some were over half an inch in diameter and freshly gnawed, others seemed several years old. I heard its shrill cry several times when near this colony, but saw only one.

The name "mountain beaver," by which this animal is known to the miners, has been given to it on account of its habit of gnawing sticks like the beaver. The Indian name is "sewellel." This particular species is *A. rufus*, and is found throughout Washington and Oregon and south in Western California to Humboldt Bay. There is a specimen in the University Museum taken by Mr. Chas. Fiebig at Eureka.

26. *Fiber zibethicus* (Linue). Muskrat.

Muskrats were abundant in the sloughs and marshes in the Carson Valley, Nevada.

27. *Neotoma fuscipes* Cooper. Dusky-footed Wood-Rat.

A wood-rat supposed to be of this species comes up to at least 3000 feet on the west slope of the Sierra Nevada. Their large nests were seen in the vicinity of Forest Hill.

28. *Thomomys bottæ* Less.

A gopher is found from the Sacramento plains up to at least 4000 feet.

29. *Zapus hudsonicus* (Zimm.) Jumping Mouse.

This mouse is included in the list of mammals found in the Sierra Nevada, on the authority of a trapper, a Mr. Dent, who informed me that he had often taken it with poison placed out for foxes and wild cats.

30. *Erethizon epixanthus* Brandt. Western Porcupine.

The presence of this species was noticed in numerous places in the high Sierra. Many pine trees about Mt. Tallac and Pyramid Peak had patches of gnawed bark, and the animal's quills were frequently found. A single dead specimen was found in a meadow near Pyramid Peak on August 10.

31. *Lepus sylvaticus auduboni* (Baird.) Cottontail Rabbit.

A few specimens of this rabbit were seen on the Forest Hill Divide, at about 3000 feet. They are abundant from the Sacramento plains up to that altitude or a little less.

32. *Lepus americanus washingtoni* Baird. Western Varying Hare.

Some of this species were seen about Dutch Flat, in Placer County, in the winter of 1891-92. In the high Sierra I am told that they are nearly white in midwinter.

33. *Lepus texianus* Waterhouse. Texan Jack Rabbit.

A few specimens were seen along the base of the mountains west of the Carson Valley.

34. *Lepus californicus* Gray. California Jackass Rabbit.

This species is very abundant in the Sacramento Valley and in the mountains to at least 2500 feet. Some were seen on the lower end of the Forest Hill Divide.

35. *Sorex* sp.? Shrew.

No doubt several species of shrews inhabit the Sierra Nevada Mountains. Tracks of a large species was seen about a marshy lake on Mount Tallac on August 3.

36. *Ursus americanus* Pallas. Black Bear.

Bears are common in places in the mountains from the Sacramento plains to the timber line. About the Sequoia grove, in southern Placer County, several individuals must have had their dens, for there were numerous fresh tracks and torn bark on the tree trunks. This bear has the local names of "brown bear" and "cinnamon bear" among hunters and miners.

37. *Ursus horribilis* Ord. Grizzly Bear.

At one time this was the most conspicuous bear in the mountains, and many wild tales are told of it by the early miners. Now, however, very few remain, and these have retreated into the wildest and most inaccessible places. From the reports of trappers there is reason to believe a few still exist on the western slopes of Pyramid Peak.

38. *Procyon lotor* (Linne). Raccoon.

This animal is abundant from the Sacramento up to at least 4500 feet. Its tracks were seen about a spring near Red Point, in June.

39. *Bassariscus astuta* (Lich.) Ring-tailed Cat.

This animal is common in the mountains up to 4000 feet or higher. The miners frequently tame them for pets.

40. *Lutra canadensis* (Turton). American Otter.

A single specimen was captured by Mr. Dent during the winter of 1891-92 on the South Fork of the American River, in El Dorado County. This animal is exceedingly rare; during ten years' trapping he had seen only five specimens.

41. *Mephitis mephitica* (Shaw). Common Skunk.

Skunks are common in the lower altitudes of the Sierra Nevada Mountains.

42. *Spilogale phenax* Merr. Little Stupid Skunk.

A single specimen was killed by a rancher on the lower Forest Hill Divide.

43. *Taxidea americana* (Bod't). Badger.

Badgers are common along the eastern base of the Sierra Nevada bordering the Carson Valley, and also in the lower western slope to at least 2000 feet.

44. *Gulo luscus* (Linne). Wolverine.

Mr. Dent informed me that he was sometimes troubled in his trapping by the depredations of wolverines. They made the rounds of his traps, eating such animals as the martin and fisher. He said they were found mostly above 5000 feet in the densest fir and pine timber.

45. *Putorius vison* (Schr.) American Mink.

A single specimen was seen in a pond in the Carson Valley, Nevada. A poultry yard near by was frequently visited by these animals and the owner had succeeded in trapping several.

46. *Mustela pennanti* Erxleben. Pennant's Martin; Fisher.

One individual was seen near the resort on Mt. Tallac shortly before my arrival. Mr. Dent informed me they were the most valuable animals to trappers, and that he frequently secured several dozen during the winter. They prefer the high wooded ridges of the west slope of the Sierras above 4000 feet.

47. *Mustela americanus* (Turton). Martin.

I learned from Mr. Dent that this species is common in the higher forests and is associated with the fisher.

48. *Urocyon virginianus virginianus* (Schr.) Gray Fox.

Foxes were noticed from the Sacramento plains up to about 4000 feet, and they no doubt go much higher.

49. *Vulpes fulvus argentatus* (Shaw). Silver Fox.

This fox is found only in the higher forests. Mr. Dent has frequently trapped it, and in the black stage of the pelage is one of the most valuable fur-bearing mammals, the skins often bringing thirty-five dollars apiece.

50. *Canis lupus griseo albus* (Linne). Gray Wolf.

This species has been seen several times by Mr. Dent in the dense forests above 6000 feet.

51. *Canis latrans* Say. Coyote.

The coyote is common on both sides of the Sierra Nevada Mountains, and in summer frequently follows flocks of sheep to

the highest meadows. This animal and the "California Lion" are the sheep-herders' greatest enemies.

52. *Felis concolor* Linne. California Lion; Panther.

This beast is common in places on both sides of the mountains and extending to high altitudes. It is very destructive to sheep and colts. Some horse ranches have had to be abandoned on account of its ravages.

53. *Lynx rufus* (Güld.) Wild Cat.

Apparently this species has about the same range as the mountain lion. None were seen about Red Point, but it is said to occur in the neighborhood and is destructive to poultry yards.

DISTRIBUTION OF SOUTHERN CALIFORNIA TREES.

BY S. B. PARISH.

The distinguishing feature of the natural vegetation of the five southern counties of California is the prevalence of shrubs. Over probably three-fourths of the surface this was the principal growth. Scattered in open order over desert and plain and valley affording clear space or sheltered covert for a multitude of humbler plants, or massed on hillsides in close and often impenetrable chaparral, it was seldom that shrubs gave place to meadows or forests. The aridity of the climate is doubtless the cause of this peculiar condition, woody plants being better able to endure a deficiency of moisture than those of a more succulent nature, while from the same deficiency the former are unable to develop into arboreal forms. From the same cause many species are here stunted shrubs or barely arborescent, which in cooler and moister climates attain to the dimensions of considerable trees.

Hence, too, at lower altitudes the arboreal vegetation is mostly riparian. The streams are scantily fringed with cottonwood, sycamore, alder, and a few species of willow, which do not extend beyond the irrigating influence of the water. In other cases the close proximity of a moist subsoil enables a grove of trees to be sustained, of which the cottonwood groves which formerly existed in the San Bernardino and the San Jacinto

February 6, 1894.

Valleys, and the palm and mesquite groves of the deserts are examples. The belt of Blue Oak (*Quercus Engelmanni*) which stretches across the hill country of San Diego County, and the park like growth of *Quercus agrifolia* which covers the slopes in the neighborhood of Pasadena, are perhaps to be attributed to the moisture supplied by the ocean fogs which roll in and condense upon the seaward exposures which they occupy. The exception to the rule is found in that peculiar forest of yucca and juniper which fringes the northern base of the San Bernardino Range from its eastern extremity to the upper end of Antelope Valley, and whose existence or limitation seems to have no perceptible connection with hydrographic conditions. Its constituent trees are the only ones that have solved the problem of arboreal growth without a continuous supply of moisture.

At higher altitudes the cooler air and greater humidity afford more favorable conditions for tree growth; the chaparral itself becomes denser and larger, and at an altitude of between 4000 and 5000 feet a coniferous forest begins which reaches nearly to the summit of the highest mountains.* This belt, which occupies the higher parts of the San Bernardino Range and its continuation, the San Jacinto and Cuyamaca Mountains, is by no means a continuous one. It rather consists of a series of forested tracts limited in area in accordance with their altitude and slope-exposure; some mere patches measured by acres, while the largest extends from near the Cajon Pass to Grayback Mountain. West of this main forest there are small bodies of coniferous trees in the Cucomonga and San Antonio Mountains, in the so-called Sierra Madre, and in the Liebre Mountains, and to the south larger and more valuable forests occupy the San Jacinto and Cuyamaca Mountains. No accurate measurements of these forest areas have ever been made, and, indeed, could not be made without great expense and difficulty, so rugged and

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* There are but two bald-topped mountains in the whole region; San Antonio, 9630 feet high, and Grayback, 11,725 feet high. The latter is pine-clad to within 200 feet of the summit, and covered with the standing trunks of dead pines to the very top, so that there cannot be said to be any point above tree line.

broken are the mountains in many parts, and so invaded and intersected are the wooded tracts by chaparral. Compared with the great forests at the north these are not only insignificant in extent, but are equally unable to sustain the comparison in the size of the trees, or the density of their growth. Scattered in loose array over the hillsides, it is only on the moister soil of the flats, or in the shelter of cañons that the trees cast a dense shade, or attain to lofty proportions; yet they do not lack the extent and magnitude to excite those feelings of admiration and exaltation which forests ever raise in the mind, while their park-like disposition and the variety of species free them from gloom and monotony.

THE SAN BERNARDINO FOREST.

The outline of the area occupied by the largest, or the San Bernardino forest is that of a wedge, the point near the Cajon Pass, broadening eastward to Grayback Mountain; the length being about forty miles, and the greatest breadth twenty miles, the district included being in part forest, and in part chaparral or barren rock. On the south from a valley base of about 1200 feet above sea level the mountains rise with great abruptness to a crest of from 4000 to 8000 feet altitude, which runs in a generally east and west direction. The northern slope of this ridge, less abrupt than the southern, constitutes the water shed of the Mojave River, and on it is located the largest and best, as well as the most accessible body of timber. This is nearly twenty miles in length, and from one to three miles in breadth. South and east of this axis, and separated from it by the gorge of the Santa Ana River, which receives their drainage, rise the twin peaks of San Bernardino and Grayback. This region is of an exceedingly rugged character, and the forests which it nourishes are broken and difficult of access.

Commencing now at the southern foot of the range, a few small spruce (*Pseudotsuga macrocarpa*) are found on sheltered western or northern exposures, along the cañons, at about 2500 feet altitude;* these increase in size and in abundance until at between 3000 and 4000 feet altitude both sides of the

* On East Twin Creek, below the Arrowhead Hot Springs, a few grow as low as 1700 feet altitude.

cañons are usually clothed with them. At about 3000 feet a thin strip of dwarf pine (*Pinus tuberculata*) stretches for some miles along the face of the range, bounded above and below by the dense chaparral of Ceanothus and manzanita, which at this altitude has replaced the Adenostoma of the lower slopes, and is otherwise unbroken for another thousand feet. At 4000 feet the spruce is displaced by the other coniferous trees which constitute the main forest. Below 5000 feet this is mostly confined to the northern slope of the range, but above that overflows to the southern side, and, indeed, below it on sheltered slope-exposures. It is essentially a yellow pine (*P. ponderosa*) belt, that being the prevailing species nearly to the tree limit; with it are commingled, without any apparent vertical disposition, many firs (*Abies concolor*) and Post Cedars, smaller numbers of Black and Big-cone Pines (*P. Jeffreyi* and *P. Coulteri*), and still fewer Sugar Pines, together with an abundance of Kellogg's Oak, especially at the lower levels. This forest continues without appreciable difference to about 11,000 feet on the sides of Grayback Mountain, where it begins to be intermixed with *Pinus contorta*, which in small isolated groups occurs in Bear Valley, as low as 6000 feet. This in turn gives way at about 11,500 feet to *Pinus albicaulis*, which alone, forming the topmost belt, reaches nearly to the summit, 11,725 feet above sea level.* On the northern side of the range, which, it must be remembered, is the one facing the desert and affected by its aridity, the spruce re-appears at about 7000 feet altitude, but very sparingly, and in small groups in sheltered and moist situations. At 6000 feet *Juniperus occidentalis* is mingled with the pines, and in one place, mixed with *Cercocarpus ledifolius*, forms a belt between 6000 and 7000 feet altitude. Beneath this, and separated from it by an interval of chaparral, is a similar belt of Piñon Pines (*P. monophylla*) between 4000 and 5000 feet, and connecting in places with the upper edge of the Yucca belt. The Juniper and the Piñon belts are about twelve miles long, their failure to extend the whole length of the range being due to other causes than elevation.

* For most of my information concerning the Grayback forest I am indebted to Mr. W. G. Wright, who has repeatedly explored that mountain.

We have then in these mountains a great Yellow Pine belt of mixed coniferous trees;* at its upper edge a belt of *Pinus contorta* is indicated, capped by a well-defined belt of *Pinus albicaulis;* on the seaward side it is based on a zone of Pseudotsuga, and on the desert side by a belt of Juniper superimposed on one of Piñon. The smaller forests to the west and south, so far as known, include only the spruce and yellow pine belts.

ECONOMIC ASPECTS.

In the San Jacinto cottonwoods a small mill was for a time employed in turning out material for orange boxes, but with this exception the trees of the lower altitudes have been utilized only as a source of fuel supply, and a most important one for a region so distant from good coal measures.

The San Bernardino forest was at once drawn upon for lumber by the first American settlers in the subjacent valleys, and has been continuously worked up to the present day. Operations have been confined to the watershed of the Mojave, the only part of the forest sufficiently accessible to be worked with profit under present market conditions. Of the original forest of this watershed less than one-third now remains. In it are now located eight steam saw mills, capable of a total output of ten million feet B. M. in a summer run of six months. From various causes, dullness of business, exhaustion of the timber supply, and the competition of northern lumber, only two or three of these mills have been operated during the last two years, and all but three of them would entirely use up their accessible timber in one or two seasons' run. The product is drawn by horse teams to San Bernardino, where it has sold within late years at from twenty to sixteen dollars per thousand B. M., nine to seven dollars of the price being chargeable to freight. Most of the lumber is, of course, yellow pine. Mill men claim that of this there are two kinds; one, recognized by the broad plates of the bark, has a thin sap-wood, and the wood is soft, straight-grained and durable, and yields a good

* As already stated, the different species composing this belt are not segregated in separate zones, but closer observation will probably show that *Pinus Jeffreyi* and *Libocedrus decurrens* have an upper limit somewhere between 7000 and 8000 feet.

percentage of clear lumber; the other, marked by a closer-checked bark, has more sap-wood, is cross-grained, readily decays, and is fit only for rough lumber. The difference of quality is said to be one of variety in the trees, and not to be due to age or place of growth. I have not been able to detect any botanical differences, except in the character of the bark, as above indicated. Black and Big-cone Pine, when sawn, is put in with the lower grade of yellow pine. The lumber from the sugar pine is most esteemed of all, most of it being clear. Post Cedar is sawn into dimension stuff, and is highly valued for its durability. It is rendered unfit for finer uses by the ravages of a dry-rot (*Dædalia vorax* Harkness) by which it is infested. The fir furnishes a light and strong lumber, but one difficult to season without warping; it is used to a small extent for scantling and bridge-flooring. None of the other trees are sawn. A few posts are made, but the destructive industry of the shingle and shake maker is a thing of the past, the market being supplied with redwood. In the San Jacinto forest there are two saw mills, their product, the amount of which I am not able to state, finding a market in the San Jacinto Valley.

The real economic value of these forests is as conservators and regulators of the water supply, a matter of most vital importance in a region dependent upon irrigation for its fertility. Fuel and lumber may be brought from afar, but water must be obtained near at hand. Fortunately public attention has been awakened to the importance of forests from this point of view, and in pursuance of the wise forestry policy of the Harrison administration, three forest reserves were set apart in Southern California, the San Bernardino Reserve of 737,280 acres, the San Gabriel Reserve, 555,520 acres, and the Trabuco Cañon Reserve, in Orange County, containing 49,920 acres. A proper supervision of these reservations will not only preserve them, but will also greatly restrict the destruction by fire and by the ravages of sheep in those portions of the forest that have passed into private ownership. Where the original forest has been removed an abundant growth of seedlings springs up, including all the species of the former growth in about their original proportions; so that if the destruction of them is prevented nature herself will in time reforest the denuded mountains.

PHYTOGRAPHIC RELATIONS.

The region here under consideration presents three distinct floras; that of the mountains, that of the desert, and that of the district between the main range and the sea coast, which may be called the intramontane. Adopting Dr. Merriam's phytographic areas, the mountain flora belongs to the Nevadan subzone, the desert to the Sonoran proper, and the intramontane to the Californian, or in a more general view the whole territory may be regarded as a part of the great Sonoran life area, into which projects, along the axis of mountains, a narrow arm of the Boreal. These relations become evident from a tabulation of the trees, and would be further enforced by an examination of the distribution of the shrubs and herbs.

MOUNTAIN AREA.

Acer glabrum	*Pinus albicaulis*
Prunus emarginata mollis	*Pinus ponderosa*
Cornus Nuttallii	*Pinus Jeffreyi*
Salix flavescens	*Pinus Coulteri*
Quercus Kelloggii	*Pinus Murrayana*
Castanopsis chrysophylla	*Abies concolor*
Pinus Lambertiana	*Libocedrus decurrens*

This zone is connected with the intramontane flora by a belt of *Pseudotsuga macrocarpa*, and with the desert flora by a belt of *Cercocarpus ledifolius* and *Juniperus occidentalis*. *Negundo Californica* and *Pinus tuberculata* also occur on the edge of this zone.

INTRAMONTANE AREA.

Rhamnus Californica	*Juglans rupestris*
R. Californica tomentella	*Quercus chrysolepis*
Acer macrophyllum	*Quercus agrifolia*
Negundo Californicum	*Quercus lobata*
Prunus ilicifolia	*Alnus rhombifolia*
Prunus demissa	*Populus Fremonti Wislizeni*
Cercocarpus parvifolius	*Salix laevigata*
Heteromeles arbutifolia	*Salix lasiolepis*
Sambucus glauca	*Salix lasiandra lancifolia*
Umbellularia Californica	*Platanus racemosa*

Lyonothamnus floribundus, *Quercus Engelmanni*, and *Pinus Torreyana* may be regarded as endemic. The bare projection into this area of the Coast flora is indicated by isolated groups of *Myrica Californica* and *Arbutus Menziesii*. *Æsculus Californica*, *Quercus Douglasii*, *Q. Wislizeni frutescens*, and *Pinus Sabiniana*, belonging to this flora barely enter our territory from the San Joaquin region, and hence are forced into a narrow belt between the desert and the mountains, over which they have been unable to pass into a region better suited to them.

DESERT AREA.

*Fremontia Californica**
Dalea spinosa
Olneya Tesota
*Prosopis juliflora**
Prosopis pubescens
*Acacia Greggii**
*Chilopsis saligna**
*Yucca baccata**
Yucca brevifolia
Pinus monophylla
*Juniperus Californica**

The close connection between this and the intramontane flora is shown by the fact that six of the above eleven species, designated by an *, pass to a greater or less extent into the intramontane district, while *Populus Fremonti Wislizeni*, of the former, passes into this desert. *Pinus Parryana*, which barely enters this area, and perhaps *Washingtonia filifera*, are prolongations of the Lower Californian subarea.

In the following table is shown the distribution in the different areas of the trees, separated according to their sizes: shrubs, and trees that barely enter the district being omitted. It will be seen that development is in accordance with the relative moisture of the different areas. The paucity of arboreal growth in the desert region is especially remarkable, when it is remembered that it is geographically the most extensive of the three.

	Mountain.	Intramontane.	Desert.	Total
Arborescent; up to 20 feet........	4	5	3	12
Small trees; up to 50 feet.	3	9	4	16
Medium trees; under 100 feet.....	4	6	1	11
Large trees; over 100 feet........	6	0	0	6
Total......................	17	20	8	45

The following list includes all species which have been reported as trees, or which are so elsewhere, although here reduced to shrubs. The dimensions given are those of full-grown, but not exceptionally large specimens. The dimensions as well as the altitudes are estimated; it is regretted that actual measurements cannot be given. The ranges are assigned from personal observation and reliable information; further knowledge is more likely to extend than to restrict them.

LIST OF TREES.

Fremontia Californica Torr. *Fremontodendron Californicum* Coville Death Val. Rep. 74. Arborescent shrub, 12 feet high, the stems 4 inches in diameter. On dry hillsides often forming extensive thickets which are conspicuous from a long distance when in bloom, from the abundance of the showy yellow flowers. The dense hairs which clothe the capsules are stinging to the flesh. Fls. May; Fr. August. Abundant along the northern, or desert, base of the San Bernardino Range from Cushenberry Cañon to Antelope Valley. Rare on the southern side of the Range; Lytle Creek. Also near San Diego, *Ganong*.

Rhamnus Californica Esch. Shrub, 12 feet high, with slender stems. Fls. April–June; Fr. Sept. Throughout the mountain region at from 2500 to 5000 feet altitude on the southern slope of the San Bernardino Range to the Coast.

Rhamnus Californica var. *tomentella* Brew. & Wats. *R. tomentella* Benth. Greene Fl. Fr. 80. Coville, l. c. 78. Like the species in habit and size, and of the same range, but less abundant.

Æsculus Californica Nutt. Small tree, or arborescent shrub. 15 feet high, trunk 6 inches in diameter, usually forming groves on hillsides; when solitary with rounded compact head. Fls. June. A single tree, edge of Antelope Valley, but abundant in the Cañada de las Uvas, at Ft. Tejon, a few miles over the Los Angeles County line. The reference to its occurrence in the San Bernardino Mountains, in the Forestry Report of the 10th U. S. Census (ix. 44) is unsupported by any data.

Acer glabrum Torr. Shrub, 5 feet high. Rare. Head-

waters of Mill Creek, San Bernardino Mountains, at 6000 feet altitude.

Acer macrophyllum Pursh. Small tree, 20 feet high, with slender trunk; often in small clumps from a common root. Fls. March; Fr. May. Common but not abundant in cañons on the southern slope of the San Bernardino Range, from San Gorgonio Pass to Los Angeles, at about 2500 feet altitude.

Negundo Californicum T & G., Fl. i, 250. *N. aceroides* Mœnch., var. *Californicum* Sargent, Gard. & For. ii, 364. *Acer Californicum* Greene Fl. Fr. 76. *A. Negundo*, L., Coville, l. c. 81. Tree 30 feet high, the trunk a foot in diameter. Leaves pinnately 3–5 foliate. Fls. March. Rare. San Bernardino Mountain, on a wet, rocky flat in a cañon above Yucaipe, at 3500 feet altitude.

Dalea arborescens Torr. The type is a fragment in the Torrey Herbarium at Columbia College, ticketed, "Fremont's 2d Exped., April 15, 1844. Mountains of San Fernando, a Southern continuation of the Sierra Nevada. A small tree." According to Fremont's Journal he was at that date in or near what is now known as Antelope Valley. It has not been met with since, although the region passed over by Fremont has been carefully examined with a view to its rediscovery by Mr. Pringle and by the writer. A low shrub, 3–4 feet high (*645 Parish*, May, 1882, distributed as *D. Californica*,) growing in ravines of the Mojave Desert at Fishponds, about 80 miles further east, agrees with the description of the species except as to size and the numerous deciduous yellow glands of the young shoots. The original character given is "*fere eglandulosa*," but the deciduous glands might easily have been absent in the insufficient type specimen. Prof. Sargent indicates in the Sylva that this is probably identical with the Fremontian plant.

Dalea spinosa Gray. Small tree 25 feet high, with intricate, bushy top; nearly leafless; the trunk, 10 inches in diameter, of an ash-gray color, as are the branches and slender twigs. Fls. June. Common in the dry washes of the Colorado Desert. Agua Caliente, (Palm Springs;) Indio; Vallecito; Carriso; etc.

Olneya Tesota Gray. Rough, spreading tree, 20 feet high, the

trunk hardly a foot in diameter. Flowers often 8–10; pod viscid, rough hirsute, and with some tack-shaped glands. Dry washes of the Colorado Desert from Indio to the Colorado River. Mesquite Cañon, etc. Larger and more abundant in Arizona.

Parkinsonia aculeata L. "Hills of the Colorado, near Ft. Yuma, *Schott*." Torrey, Mex. Bound. 59.

Parkinsonia microphylla Torr. "Colorado River, near Ft. Yuma," Torrey, l. c. These two species of Southern Arizona have not been observed by recent collectors at the above station.

Parkinsonia Torreyana Wats. Straggling tree, 15 feet high, trunk 10 inches in diameter. Fls. April. Frequent in dry washes of the Colorado Desert from Toros to the Colorado River; Indian Wells, etc.

Prosopis juliflora DC. Straggling tree 20 feet high, usually several stemmed from the base, or arborescent. In various kinds of soil, but indicating a damp subsoil, and attaining its greatest development in the desert. Fls. (at San Bernardino) May; Fr. September. Throughout the entire desert region, scattered, or rarely, as at Indio, forming groves. As a shrub extending as far west as San Bernardino, Temecula, and San Diego.

Prosopis pubescens Benth. Arborescent shrub, 15 feet high, with slender stem. Common, but less abundant than the last, through the desert region, usually growing in ravines or the borders of dry washes. Whitewater; Warm Springs, etc.

Acacia Greggii Gray. Armed shrub 2–10 feet high, forming dense thickets of small extent, usually on dry hillsides. Western border of the Colorado desert at 2000–3000 feet altitude; San Gorgonio Pass; San Felipe. Also at Warner's Hot Springs, within the intramontane district.

Prunus emarginata Walp., var. *mollis* Brewer. Arborescent, the slender stems 10–15 feet high, usually several clustered. Leaves and stipules glandular toothed, lower surface of leaves sparsely hirsute, peduncles and petioles tomentose with long, soft hairs. Fls. June. Rare. Border of streams in ravines, Bear Valley, 6000 feet altitude, San Bernardino Mountains.

Prunus demissa Walp. *Cerasus demissa* Greene, Fl. Fr. 1. Shrub 2–6 ft. high, on hillsides, often in open patches.

Fls. May–June; Fr. August. Not uncommon in the Cuyamaca and San Bernardino Mountains at about 4000 feet altitude. Waterman Cañon; Mill Creek; etc.

Prunus ilicifolia Walp. *Cerasus ilicifolia* Nutt. Greene, l. c. 50. Shrubby, or arborescent and 15 feet high, with trunk 6 inches in diameter. Fls. April to June, according to altitude. Fr. red, pulpless, and astringent, October. Common on gravelly benches and hills from 4000 feet altitude on the southern slope of the San Bernardino range to the Coast. A more tree-like form of Santa Catalina Island, first collected by *Lyon*, is *P. occidentalis*, Lyon, Bot., Gaz. xi, 202, 333; Greene Bull. Calif. Acad. ii, 395. *P. ilicifolia*, var. *occidentalis* Brandegee, Proc. Calif. Acad. 2d. Ser. i, 209; Zoe, i, iii. *P. ilicifolia* var. *integrifolia* Sudworth, Gard & For. iv, 51.

Cercocarpus parvifolius Nutt. Arborescent, 12 feet high, the slender stems 4 inches in diameter. Fls. March; Fr. August. Southern slope of the San Bernardino range as high as 3000 feet altitude, passing along washes far out into the plains; thence throughout the Coast mountains.

Cercocarpus ledifolius Nutt. Small tree, 20 feet high, trunk 10 inches in diameter. Abundant on dry ridges on the northern side of the San Bernardino Mountains, at 6000 to 8000 feet altitude. Bear Valley; Holcomb Valley.

Heteromeles arbutifolia Nutt. Compact shrub, 12 feet high. Fls. June; Fr. December. Common on hillsides from 2500 feet altitude on the southern slope of the San Bernardino Range to the Coast, and on the adjacent islands.

Lyonothamnus floribundus Gray, Proc. Am. Acad. xx, 291, Lyon, Bot. Gaz. xi, 333. Brandegee, Zoe i, iii, t. 5. Small tree, growing in groves on the sides of cañons on Santa Catalina Island; endemic, and first collected by *Lyon* in July, 1884, in flower.

Cereus giganteus Engelm. Said to occur along the Colorado River, (Engelmann, Bot. Calif. ii, 450), but there seems to be no evidence of its presence in the State.

Cornus Nuttallii Audubon. Slender tree, 25 feet high, the trunk 10 inches in diameter, or often arborescent. Banks of

streams in the San Bernardino Mountains, at from 4000 to 5000 feet altitude.

Sambucus glauca Nutt. Small tree, 15 feet high, trunk a foot in diameter, and hollow, or reduced to a shrub. At lower altitudes the leaves are mostly deciduous in summer, starting again with early rains in December or January. Fls. April, May. Fruit blue or white, and with a white bloom, agreeable, July, August. Common on dry soil from about 4000 feet altitude on the southern slope of the San Bernardino range to the Coast, and on the island of Santa Catalina.

Sambucus Mexicana Presl. Accredited to Southern California in the Synoptical Flora, but I have been unable to verify its occurrence within the limits of the five southern counties.

Arbutus Menziesii Pursh. Small tree 15–25 feet high, the trunk 4–8 inches in diameter. A single small group among oaks, on the Mount Wilson trail, south side of the San Bernardino range, at 2300 feet altitude. *Davidson, McClatchie.*

Fraxinus Oregana Nutt. Small tree 25 feet high, trunk a foot in diameter, or more frequently arborescent, 8–15 feet high, and growing in thickets. Fl. April; Fr. September. Dry slopes, northern base of the San Bernardino Mountains, at 4000 feet altitude, Burcham's Ranch. On the southern slope from 3000 feet altitude (Lytle Creek; City Creek;) to the San Bernardino Valley, 900 feet altitude. Also in the San Jacinto Mountains, and at Warner's Hot Springs.

Chilopsis saligna Don. *C. linearis* DC., Coville, Death Valley Rep. 174. Small tree, 20 feet high; trunk 8 inches in diameter, or arborescent. Fls. June. Dry washes of the Colorado and Mojave Deserts, common; also as a shrub at Brookside, near Redlands, and in the San Jacinto Valley.

Umbellularia Californica Nutt. Arborescent, 20 feet high, growing in groups, seldom, if ever, a tree. Fls. March. Common along the bottoms of cañons, southern slope of the San Bernardino Range at 2000 to 2500 feet altitude.

Platanus racemosa Nutt. Spreading tree 75 feet high, the trunk 4 feet in diameter; in the mountains sometimes arborescent, Fls. April; Fr. September. Common near watercourses, from

3000 feet altitude, on the southern slope of the San Bernardino Range to the Coast. A tree growing in sandy loam at San Bernardino measures 9½ feet in circumferance at 3½ feet from the ground; height about 60 feet. Another similarly situated is 13 feet 3 inches in circumference; broken off about 25 feet from the ground.

Juglans rupestris Engelm. in Torr., Sitgs. Rep. 171 t. 15; Sargent, 10th Census ix, 131. *J. Californica* Wats., Bot. Calif. ii, 93; Greene, Fl. Fr. 74. Arborescent shrub 15 feet high, growing in clumps, or rarely a tree 30 feet high, the trunk a foot in diameter. In cañons on the southern slope of the San Bernardino Range up to 3000 feet altitude, and occasionally along washes at some distance from the foot of the mountains.

Myrica Californica, Cham. Arborescent, in clumps, 12 feet high. Collected only in Rustic Cañon near Santa Monica, where, according to Dr. Hasse, it is scarce, and grows in shady, springy places.

Quercus lobata Née. Fort Tejon, a few miles over the Los Angeles boundary, in Kern County, is situated in a grove of magnificent oaks of this species, some of them 7 and 8 feet in diameter. Within our limits it has been reported from La Liebre Rancho in Antelope Valley.* A single tree has been observed by Dr. Hasse at Santa Monica. It may be expected in the intervening mountains.

Quercus Douglasii H & A. This species barely reaches Los Angeles County on the desert side of the Liebre Mountains (*Coville*).

Quercus Engelmanni Greene, W. Am. Oak. 33, t. 17. *Q. oblongifolia* Engelm., Bot. Calif. ii. 96. Rather spreading tree, 40 feet high, the trunk 3 feet in diameter. Coast mountains of San Diego County, 15–20 miles from the sea, where it covers the hills in open groves; Pala; Fallbrook; etc. Rare on the interior slope of the same mountains; Marietta. Reported in the Bot-

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*Merriam, N. A. Fauna vii, 333. Sargent's reference to the "San Bernardino Mountains" (10th Census ix, 138), probably applies to the same region, as no other station is known.

any of California at San Gabriel, but nct met with there by recent collectors.

Quercus Macdonaldi, var. *elegantula* Greene, l. c. 26, 86, t. 29. The type of this oak was a tree 20 feet high, with a trunk a foot in diameter, discovered by Prof. Greene in 1885, in Temecula Cañon near Fallbrook. As a shrub from 4 to 12 feet high, and exhibiting great variation in shape and size of leaf and fruit, it is not uncommon from Fallbrook to McGee's store, near Temecula. Apparently it is confined to the region jointly occupied by *Q. Engelmanni* and *Q. dumosa*, between which species it is probably a cross, as was suggested by its proposer.

Quercus chrysolepis Liebm. Spreading but compact tree 40 feet high, the trunk 2 feet in diameter, or sometimes reduced to a shrub. Wood hard and brittle. Cañons of the San Bernardino Range, from 1000–5000 feet altitude on the southern slope, and from 5000–6000 feet on the northern.

Quercus Wislizeni A.DC., var. *frutescens* Engelm. Small tree, 20 feet high. Dry hills on the desert slope of the Sierra Liebre Mountains, between Elizabeth Lake and Tejon Pass.

Quercus agrifolia Née. Occasionally a large, spreading tree, 70 feet high, the trunk 4 feet in diameter, (Edgar Cañon, San Gorgonio Pass, altitude 2800 feet;) oftener of smaller size, 30 feet high and the trunk 18 inches in diameter. Widely distributed, but usually not very abundant, especially throughout the coast mountains, Fallbrook; Temecula; Marietta. Santa Monica Range, *Hasse*. Also about Pasadena, where it covers the hills with open groves.

Quercus Kelloggii Newberry. *Q. Californica* Cooper, Smith. Rep. 1858, 261; Sudworth, Gard. & For. v, 98; Coville, l. c. 196. Tree of spreading, open habit, 70 feet high, the trunk 4 feet in diameter, or at high altitudes reduced to a shrub. Fls. May–June. Common throughout the coniferous belt of the San Bernardino Range and the San Jacinto Mountains, at from 4000 to 8000 feet altitude.

Castanopsis chrysophylla, A. DC. Low shrub, 1 to 4 feet high, covering the slopes of the higher mountains, at from 7000 to 9000 feet altitude, with a dense and impenetrable chaparral.

Fls. June. Bear Valley; San Jacinto Mountains; San Antonio Mountain.

Alnus rhombifolia Nutt. Parry, Bull. Cal. Acad. ii, 351. *A. oblongifolia* Torr. Slender tree, 50 feet high, the trunk 2 feet in diameter. Fls. January. Abundant along streams from 3000 feet altitude on the southern slope of the San Bernardino Range to the Coast. San Jacinto Mountains; Cuyamaca Mountains. Santa Monica, *Hasse*.

Salix nigra L. Fort Mojave, the station noted for this willow in the Botany of California, is in Arizona, but it may be expected on the Californian side of the Colorado. Mr. Bebb informs me that there is in his herbarium a specimen of the subvar. *venulosa* Anders., a pubescent form of the var. *longipes*, Anders., collected by Dr. J. T. Rothrock at Elizabeth Lake, No. 187, Survey of the 100th Meridian. I have been able to find no other evidence of the existence of this tree within our limits.

Salix lævigata Bebb. "Black Willow." The largest of the Southern California willows, 25 feet high, the trunk 18 inches in diameter, or infrequently shrubby. Fls. April. By streams or in meadows; common from 2000 feet altitude on the southern slope of the San Bernardino Range to the Coast, and on Santa Catalina Island.

Salix lasiandra Benth., var. *lancifolia* Bebb. Rarely a small tree, 20 feet high, the trunk 10 inches in diameter; usually reduced to a shrub. Fls. May. Situation and continental range of the last species.

Salix longifolia Muhl. Reduced to a shrub. Sandy banks of streams, away from the water. Borders of the Colorado Desert, at Agua Caliente (Palm Springs), also at Lytle Creek near San Bernardino. This wide-spread species probably has a more extended range in this region than here indicated, but material and records are wanting for its definition. It is with difficulty distinguished from some forms of *S. sessilifolia* Nutt., a very common and very variable willow of the region.

Salix flavescens Nutt. Reduced to an arborescent shrub, 12 feet high. Fls. June. Stream banks in the San Bernardino Mountains at from 7000 to 8000 feet altitude.

Salix lasiolepis Benth. "White Willow." Arborescent, or sometimes a small tree, 20 feet high, the trunk 10 inches in diameter. Fls. December and January, many of the leaves persisting later. Common by streams and in meadows, from 3000 feet altitude on the southern slope of the San Bernardino Mountains to the Coast.

Populus trichocarpa T. & G. "Black Cottonwood." Small tree, 40 feet high, the trunk 18 inches in diameter. Fls. March. Along mountain streams from 3000 feet altitude on the southern slope of the San Bernardino Range to the Coast; also on Santa Catalina Island.

Populus Fremonti var. *Wislizeni* Wats. Spreading tree 80 feet high, the trunk 4 feet in diameter; or in the desert region often reduced to a straggling, misshapen tree 25 feet high, with trunk not exceeding 18 inches in diameter. Fls. February, March. Three trees on sandy loam at San Bernardino measure respectively 12 feet 4 inches, 11 feet 10 inches, and 8 feet 5 inches in circumference, each being about 70 feet in height. Prevalent throughout the entire region, mostly in the neighborhood of water. It ascends the southern slope of the San Bernardino Range to 2000 feet altitude, and the northern slope to 3500 feet. In the San Bernardino and San Jacinto Valleys there were formerly extensive groves of large trees now nearly destroyed. There is also a narrow fringe of large trees along the Mojave River from opposite Hesperia to Camp Cady. Elsewhere in the desert region the tree is sparsely present along water courses in the cañons, or, where the water is permanent, fringing its borders, as at Morongo Creek.

The species is reported in the 10th Census Report (ix, 175) as collected at "Colton, *Parry*," but I have been unable to detect it, and the late Dr. Parry was not aware of its existence at that station.*

Yucca baccata Torr. Occasionally 15 feet high, with trunk less than a foot in diameter, or acaulescent, branches short, stiff

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* *Populus monilifera* Ait. Trees referred to this species by Prof. Sargent, are in cultivation at Colton as street shade trees. Their origin is uncertain, and the species has never been found in a wild state in this region.

and irregular. Fls. March. Attaining its greatest development in the desert region, throughout which it is scattered, either solitary, or rarely in small groups, on dry hillsides or in washes, up to 4000 feet altitude. In similar places, but less frequent and smaller, from 1500 feet altitude along the southern base of the San Bernardino Range to the coast. In the Death Valley Report, page 202, Mr. Coville restricts the name *Y. baccata* to the acaulescent forms, separating those with trunks as *Y. macrocarpa* Coville, *non* Engelm. on the ground of their arborescence, smaller flowers and yellowish-green leaves.

Yucca brevifolia Engelm., Bot. King Exp. 496; Trelease, 4th Rep. Mo. Bot. Gard. 193. *Y. arborescens* Trelease 3d Rep. 163; Merriam, N. A. Fauna vii, 353; Coville, Death Vall. Rep. 201. Uncouth tree, angularly branched, 30 feet high, trunk 18 inches in diameter. Fls. April; Fr. August. On dry benches and hills along the northern base of the San Bernardino Range, from Cushenberry Springs to Gorman's Ranch, at the upper end of Antelope Valley, occupying a belt between 2500 and 4000 feet altitude and forming an open forest, interrupted in places, and varying in width, the greatest said to be opposite the Cajon Pass, 12 miles *(Merriam)*, where a few trees are also found a short distance south of the summit. At Cactus Station, at the head of Cushenberry Cañon, there is a considerable grove at 5000 feet altitude at the Upper edge of the piñon belt. An interrupted belt is also found between Daggett and Pilot Knob *(Merriam).*

Washingtonia filifera Wendl. *W. robusta* Wendl. Handsome tree 60 feet high, the trunk 3 feet in diameter. A cultivated tree at Los Angeles, 42 years old, measures 60 feet in height and 10 feet 7 inches in circumference. One at San Bernardino in adobe soil, 22 years old, is 32 feet high and 9 feet 2 inches in circumference. Flowers on the desert in June, and fruit ripens in September; cultivated trees at San Bernardino flower in August, fruit ripening in February. This palm grows, often in extensive groves, in wet and usually alkaline soil at the bases of the mountains along the eastern borders of the depression in the Colorado desert once occupied by an inland sea; a few scattered trees mark the channel by which it was connected with the Gulf of California (*Orcutt.*) The groves extend for several miles up

some of the cañons of these mountains; smaller groves are found in the cañons of the San Jacinto Mountain, near Agua Caliente (Palm Springs), and a few trees in the Whitewater Cañon on the eastern side of the San Bernardino Mountain mark the western limit of the species.

Washingtonia robusta is an obscure species, described from young cultivated plants, and has never been identified with any uncultivated trees. Its identity with *W. filifera* can hardly be doubted. See Watson, Proc. Am. Acad. xxv, 136; Parish, Gard. & For. iii, 51, 542; Orcutt, W. Am. Sci. i, 63, 76.

Pinus Lambertiana Dougl. Tree of large size, 200 feet high, trunk 8 feet in diameter. Scattered throughout the higher mountains at from 5000 to 7000 feet altitude, usually in the richer and moister sort of flats and cañons. San Bernardino and San Jacinto Mountains.

Pinus albicaulis Engelm., Trans. St. Louis Acad. ii, 209; Bot. Gaz. vii, 4; Coll. Wks. 329, 383. *P. flexilis* James var. *albicaulis* Engelm., Bot. Calif. ii, 124. Tree 40 feet high, the trunk 2 feet in diameter, or at its upper limit gnarled and prostrate and but a few feet in height. On Grayback Mountain, constituting the upper edge of the timber belt, and extending from 1000 feet below the summit (11,725 ft.) to within 100 feet of it. Dead trees, probably of this species, are scattered up to the summit. (*W. G. Wright.*) This is the Southern known limit of this pine.

Pinus Parryana Engelm. Symetrical tree, 20 feet high, trunk a foot in diameter. Forms extensive forests on dry mountains in Lower California, a few trees probably straggling across the boundary; a single one observed near Larken's Station June, 1890, in flower.

Pinus monophylla Torr. & Frem. Irregular tree, 30 feet high, the trunk 18 inches in diameter. Fls. June; Fr. Sept. Rocky cañons and ridges on the north side of the San Bernardino Mountains, from Cushenberry Springs to Cox's Ranch. Reported by Bigelow (Pac. R. R. Rept. iv, 15), from Cajon Pass, but not now found there.

Pinus Torreyana Parry. Sea coast hills at Del Mar, San

Diego County; until recently the only known locality for this species, but a second small grove has been discovered on Santa Rosa Island.

Pinus ponderosa Dougl. "Yellow Pine." Noble tree 200 feet high, with a trunk diameter of six feet. Fls. June. Ridges and slopes, or of a larger size on flats, at from 4000 to 11,000 feet altitude, throughout the San Bernardino Range, the San Jacinto and Cuyamaca Mountains, forming the greater part of the coniferous forest.

Pinus Jeffreyi Balf. "Black Pine." Denser-headed tree, 75 feet high, the trunk 3 feet in diameter. Range of the last, usually on flats or near streams; scattered and not abundant, and probably absent above 8000 feet altitude.

Pinus Murrayana Balf. Spreading tree 50 feet high, trunk-diameter, 2 feet. Grayback Mountain, scattered through the upper part of the yellow pine belt, between 10,000 and 11,000 feet altitude. (*Wright.*) A few small groups on low gravelly points at the lower end of Bear Valley, in the San Bernardino Mountains, at 6000 feet altitude.

Pinus Sabiniana Dougl. "Sierra La Liebre, descending nearly to Antelope Valley." *Merriam*, N. A. Fauna vii, 336. This is the only authentic locality in the Southern counties. It has been reported (Orcutt, 1st Calif. For. Rept., 50) from San Diego County, but apparently erroneously.

Pinus Coulteri Don. "Big-cone Pine, Bull Pine." Somewhat spreading tree, 50 feet high, trunk-diameter 2½ feet. Usually on dry ridges, less frequently on gravelly benches (Mill Creek), at from 5000 to 6000 feet altitude, in the San Bernardino and San Jacinto Mountains.

Pinus tuberculata Gordon. *P. attenuata* Lemmon, Min. & Sci. Press, Jan. 16, 1892; Gard. & For. v. 65; N. Am. Conebearers 10; Erythea i, 229. Sudworth U. S. For. Rept. 1892, 329. Coville Death V. Rept. 221. Regular and handsome tree, branched from the ground, 15 feet high, trunk, 8 inches in diameter. An interrupted belt, 5 miles long and one-half mile wide along the southern slope of the San Bernardino Mountains, at about 3000 feet altitude, from East Twin Creek to

City Creek. Reported by Sargent (10th Census ix, 194), from the San Jacinto Mountains, but this needs confirmation.

Pseudotsuga macrocarpa, Lemmon, 3d Calif. For. Rep. 134; W. Am. Coneb. 12; Sudworth, U. S. For. Rep. 1892, 330. Coville, Death Val. Rep. 223. *P. Douglasii*, Carr. var *macrocarpa* Engelm. Rather irregular tree 150 feet high, 4 feet in trunk-diameter. Bears light crops of cones, the reported fecundity perhaps exceptional. Throughout the San Bernardino Range from the Sierra Liebre east to Grayback Mountain, most abundant on the south slope, where it is usually scattered on the sides of cañons, between 2500 and 5000 feet altitude, but on Mount Wilson said to form "extensive forests" (*McClatchie;*) On the northern slope rare, and at higher altitudes; Gold Mountain, 7000 feet altitude. Also on San Jacinto Mountain, and in San Felipe cañon (type) between Banner and Julian. The technical characters of the species are weak, but it may perhaps be maintained for the sake of the difference in appearance and character of wood between it and its northern relative.

Abies concolor Parry, Am. Nat. ix, 304. Sudworth, Torr. Bull. xx, 42; *A. Lowiana* Lemmon, W. Am. Coneb. 14. Stately tree 150 feet high, 4 feet trunk-diameter. In cañons, on flats, or on ridges, scattered or in small groups, throughout the coniferous belt in the San Bernardino Range and the San Jacinto Mountains, at from 4000 to 8000 feet altitude.

Sequoia sempervirens, Endl. In the First Calif. For. Rep. 27, reprinted in 2d U. S. For. Bull. 201, a small grove of redwood is reported as growing in a remote part of the "Sierra Madre" Mountains of Los Angeles County. Mr. Abbot Kinney informs me that after a careful examination of the supposed location of the grove he has proved this report to be unfounded.

Libocedrus decurrens Torr. Handsome tree, 150 feet high, trunk 5 feet in diameter. Usually in cañons or on flats, scattered, at from 4000 to 7000 feet altitude, throughout the San Bernardino Range and the San Jacinto Mountains.

Cupressus Guadalupensis Watson. "Ravines near the Old Mission, San Diego, not abundant." (*C. R. Orcutt, in lit.*)

Juniperus Californica Carr. Small tree, 20 feet high, trunk

diameter 8 inches. Fls. February; Fr. September. Dry plains or hills, scattered, or occasionally in groves, at from 1000 to 3000 feet altitude, from the southern slope of the San Bernardino Range to the Coast Mountains (San Bernardino; Temecula). On the northern slope abundant and sometimes larger, scattered through the upper part of the *Yucca brevifolia* belt, between 3000 and 4000 feet altitude, extending from Cushenberry Cañon to the upper end of Antelope Valley.

Juniperus occidentalis Hook. Tree, 40 feet high, the trunk 2 feet in diameter. Northern side of the San Bernardino Mountains, at 6000 to 7000 feet altitude. Bear Valley; between Halcomb Valley and Green Lead, forming a considerable forest, unmixed with other coniferous trees.

NOTES ON LEPIDOPTEROUS LARVÆ.

BY C. H. TYLER TOWNSEND.

I. LEPIDOPTEROUS LARVÆ WHICH BORE THE FLOWER-STALKS OF DASYLIRION.

Several lepidopterous larvæ were found May 18, 1892, in a dead flower stalk of *Dasylirion wheeleri*, on Tortuga Mountain, which is on the Mesa about five miles to the southeast of Las Cruces, New Mexico. The stalk containing these larvæ was an aborted one, which for some reason had died when it reached the length of a foot and a half, but had still become hard and woody. Probably the death of the stalk was caused by the larvæ, which were found boring in tunnels inside its base, like coleopterous larvae.

Description of Larva.—Length, 30 to 42 mm.; width of mesothoracic segment, 6⅓ to nearly 7 mm. Whitish, nearly naked, elongate, widest anteriorly (on mesothoracic segment), with three pairs of quite well-developed thoracic legs, and five pairs of distinct but aborted and approximated prolegs. Head and dorsum of prothoracic segment corneous, of a tawny brownish tinge; rest of larva fleshy. Head about one-half width of mesothoracic segment, base retracted within prothoracic segment, sparsely hairy on

anterior portions. Antennæ three-jointed, first two joints cylindrical and of same length, basal joint about twice the diameter of second, third joint very small and short, second joint with a terminal bristle and an additional short one arising beside the third joint. Mandibles strong, faintly notched on apical edge, showing three distinct teeth. Maxillary palpi four-jointed, basal joint short and stout, second joint about same diameter but three times as long; third joint nearly as long as second, about one-half the diameter of latter, cylindrical; third joint minute. Labial palpi two-jointed, slender and elongate, basal joint tubercle-like and short; second joint elongate, not as thick, subcylindrical. Spinneret elongate and tapering to a point, longer than labial palpi. Prothoracic and metathoracic segments about equal in width, a little narrower than the mesothoracic. Abdominal segments a little narrower still, and about equal in width from segments 5 to 11; 12 and 13 gradually and successively narrowed, 13 with a transverse dorsal crease midway making it appear as 2 segments. Segments 2 to 4 (thoracic) about equal in length; 5 and 6 much shorter, nearly equal; 7 to 11 longer than thoracic, about equal, or 9 and 10 somewhat the longest; 12 and 13 shorter and nearly equal in length. A few hairs on dorsum of prothoracic segment, and on anal segment, very few on other segments.

Described from three specimens.

In the same stalk with the above there was also found a live lepidopterous pupa, which can hardlv belong to the same species as the larvæ since it is so much smaller in size. It may be briefly described as follows:

Pupa.—Length, 16 mm.; width on thorax, 4½ mm. Elongate, pale flavous brownish in color; terminated anteriorly with a stout and short process, which ends in a point on a level with the ventral surface. Eyes at inferior base of this process. Antennal, leg, and wing sheaths reaching to fifth abdominal segment; antennal sheaths consisting of many short joints, gradually growing slightly longer and narrower toward end of sheath. Dorsal portion of each abdominal segment with an anterior transverse row of short, stout, sharp-pointed spines, their tips brown; and a posterior row of much smaller, more closely approximated and even spines. Anal segment is appar-

ently without this posterior row, but has instead a terminal circlet of spines of different sizes, a lateral one on each side much the largest and rather claw-shaped, with the point directed inferiorly. The other spines are much smaller.

Described from one specimen.

II. LYCÆNID ON MESQUIT.

Four specimens of a beautiful light green lycænid larva were beaten, May 16, 1891, from *Prosopis juliflora* south of Mesilla, New Mexico. At the time of capture, they measured from 5 to 7 mm. long, and were of the exact shade of green of the mesquit leaves. They feed on the underside, thus escaping observation. The head, in these and other lycænid larvæ, appears to the naked eye as a small black tubercle on the ventral aspect of the cephalic end of the body, which with their other characters gives them much the appearance of certain dipterous larvæ.

Description of Larva.—Length (strongly curved), 4 to 7 mm.; greatest width, 2 to 3 mm.; greatest thickness, 2 mm. Quite similar in general outline and appearance to the lycænid on *Atriplex* described by the writer, from Arizona (Am. Nat. 1893). Differs only as follows: Light green in color, with a thick clothing of minute and more spinous tubercles, from each one of which springs a minute hair. With or without the median and lateral rows of reddish spots on segments 3 to 10 (two with and two without). One of the specimens, with the red spots, has also a more or less yellowish area on each side of the median row of spots. The dorsa of segments strongly or hardly at all produced into the raised transverse ridges (one strongly, two moderately, and one very faintly). Anterior segments gradually increasing in width, to segment 6, segments 6 to 10 about equal in width, posterior ones narrowing to anus. Some or none of the minute black spinous tubercles interspersed among the whitish ones (more in two cases—same two specimens referred to above as having the rows of red spots; and a considerable number along dorsal region in the other two). All four differ in having none of the short and stout black spines on anterior portion of dorsum

of prothorax, which instead is longer hairy especially on borders; moreover all the segments (except head) present a pubescent appearance, being covered with the short hairs arising from the spinous tubercles, these hairs usually (in three specimens—not in the faintly humped one) becoming longer on the dorsum along the median row of hump-like transverse ridges. The pubescence in these three specimens (above mentioned) also becomes somewhat longer along the sides of the larva. Head not so glabrous, black, but not so polished. Eyes apparently nearly the same. Mandibles apparently nearly the same. Legs and prolegs same; spiracles same, consisting of 9 pairs, on sides of segments 2, and 5 to 12, those on 11 and 12 situated more on dorsum of segments.

Described from four specimens. Southern N. Mex. General colors noted in life. It had occurred to me that possibly there were two species represented in the above larvæ, but their uniform pubescence and the connecting variations between them lead one to consider them as belonging to the same species. Their pubescence seems to point them out at once as distinct from the species on *Atriplex*.

Mr. W. H. Edwards has treated in a most interesting manner of the special organs of segments 11 and 12 in the larva of *Lycaena pseudargiolus* (Butt. N. Am. vol. ii. Lycaena ii, iii, pp. 10–16). A figure is given of the last segments (p. 14), showing these organs. All of the four larvæ above described from mesquit show the organs very plainly; the median transverse opening on 11, and the two tubes on 12 wholly withdrawn inside and showing as a rounded stigma-like organ with many wrinkles radiating from the centre.

III. LARVA OF OIKETICUS TOWNSENDI (RILEY MSS).

This species is our common bag-worm in Southern New Mexico. Some detailed notes have been published on this species in the *Can. Ent.*, 1892, p. 199, under the name "*Thyridopteryx* sp." Specimens had been sent to Dr. Riley, who wrote me too late for insertion in the above-mentioned notes that the insect proved to be a new species of *Oiketicus*, which he would describe at some future time under the above name. The present seems an ap-

propriate time to publish the following description of the larva, which was drawn up some time ago.

Larva.—Length (after being much contracted in alcohol), 20 to 32 mm.; greatest width (7th and 8th segments), $7\frac{1}{2}$ to $10\frac{1}{2}$ mm. Black, naked except a few hairs on head and thoracic feet, head and thoracic segments corneous dorsally and variegated with whitish, rest of body fleshy. Three pairs of strong 3-jointed thoracic legs, each armed with a stout terminal claw; five pairs of prolegs, on segments 7 to 10 and 13. The lateral plates of dorsa of segments are hardly whitish, or faintly so anteriorly in continuation of the whitish lateral line of thoracic segments. There is also an inner lateral line on each side on each of the thoracic segments, and a median line on the prothoracic and mesothoracic only. The prolegs, with lateral portions of ventral surface, are also more or less whitish. Head is considerably narrowed, about half retracted within prothoracic segment. Antennæ 3-jointed, first joint very stout and subconic with a truncate apex, about as long as basal diameter; second joint very short and retracted within the basal joint so that it is not conspicuous; third joint slender and subcylindrical, nearly as long as basal joint but not more than one-third its mean diameter, terminated by a bristle nearly three times its own length. Maxillary palpi 4-jointed, basal 2 joints subequal, stout; third joint hardly as long and about one-half the diameter of second; fourth joint minute. Labial palpi slender, consisting of a basal elongate subcylindric joint terminated by a stout, pointed, bristle-like style about its own length, with a minute joint at its base. Spinneret elongate, slender, pointed. Labium with a deep notch on anterior margin, bristly. Mandibles very strong, strongly 4-toothed apically. Head is in younger specimens mostly whitish, only finely marked or speckled with blackish or brown. Prothoracic segment a little wider than head, fully or more than one-half as long as wide; mesothoracic segment wider than prothoracic but only one-half as long; metathoracic slightly wider than mesothoracic, and about same length, as is also the fifth segment (first abdominal), which latter is a little wider than metathoracic. Segments 6 to 11 very gradually increasing in length, 11 being the longest; 12 a little shorter and narrower; 13 a little long

and still more narrowed, with a transverse dorsal crease on anterior two-thirds, making it appear as two segments. In contracted alcoholic specimens the seventh and eighth segments are the widest; but in a fresher specimen the mesothoracic to eighth segments are about same width, 9 and 10 hardly narrower. Anal prolegs more developed than others.

Described from six alcoholic specimens, five, including the largest, collected March 15, 1891. Color noted in life.

SOME NEW AND SOME OLD ALGÆ BUT RECENTLY RECOGNIZED ON THE CALIFORNIA COAST.

BY C. L. ANDERSON.

PUNCTARIA WINSTONII n. sp.

(*Class* MELANOPHYCEÆ; *Order* DICTYOTACEÆ.)

Fronds tufted, arising from a small naked disk, with very slender filamentous stipes, which gradually widen into tough, leathery, areolated lamina, thin, membranaceous, ¼–1 inch wide and 2–10 inches high, of a dark olive green color. Cells cuboidal or roundish. *Oogonia* and *tetraspores* in the same sori, the former spherical or pear-shaped. Hairs and paraphyses absent. Adheres well to paper, and in drying has a distinct odor of new leather. In the older plants there are perforations, erosions, and lacerations of the leaf.

For a long time I have wondered why species of Punctaria had not been discovered on our Coast. Last summer Mr. Harry B. Winston, a young and zealous collector of Algæ, found this species at Carmel Bay, growing on the old stems of Egregia. It seems closely allied to *P. plantaginea*, Roth., of the Atlantic Coasts in shape and color. It has probably been mistaken when young by collectors for *Phyllitis fascia*, which it slightly resembles and which is very common. It differs from *P. plantaginea* in having spherical or pear-shaped oogonia instead of cuboidal, and in the absence of hairs and paraphyses. Probably it grows on the rocks and on other algæ than Egregia, but so far has only been found on that one plant. It grows in a sheltered cove near Chinese fishing huts on the north side

February 7, 1894.

of Carmel Bay where Mr. Winston and his parents have col lected many novelties, and some of the most beautiful Algæ ever found on our Coast.

Prof. Farlow, who has examined specimens of this alga, is inclined to the opinion that it is the same as *Coilodesma Californica* of Ruprecht and Kjellman. *Coilodesma* is the old genus *Adenocystis* of Hooker and Harvey, Flora Antarctica. This may be so. But our plant seems to agree so well with the Dictyotaceæ and the genus Punctaria that I am inclined, notwithstanding differences in structure of frond and fruiting, to regard it as belonging properly as above indicated until Coilodesma is proven to stand in place of Punctaria.

DESMARESTIA ACULEATA, Lmx.

(*Class*, MELANOPHYCEÆ; *Order*, ECTOCARPACEÆ.)

This alga was collected at Moss Beach, near Pacific Grove, by Bradley M. Davis, in June, 1892. The long cord-like branches and even the main stems were covered with a fine growth of branching filaments. It does not seem to be abundant, as this "find" is the only one I know of. It is common on the Atlantic Coasts and has also been collected at Kamtschatka, on the northwest coast.

DESMARESTIA VIRIDIS, Lmx.

(FUCUS VIRIDIS, *Fl.Dan.;* DICHLORIA VIRIDIS, *Grev.*)

This is a long known European alga, and was found on the Alaskan Coast, but was not discovered on the Californian Coasts so far as I know, until the summer of 1892, when Mrs. B. C. Winston collected it in Carmel Bay, adding this pretty alga to many other unexpected trophies found in the line of natural history on that beautiful bay.

NEMALION LUBRICUM, Duby.

(*Class*, RHODOPHYCEÆ; *Order*, HELMINTHOCLADIACEÆ.)

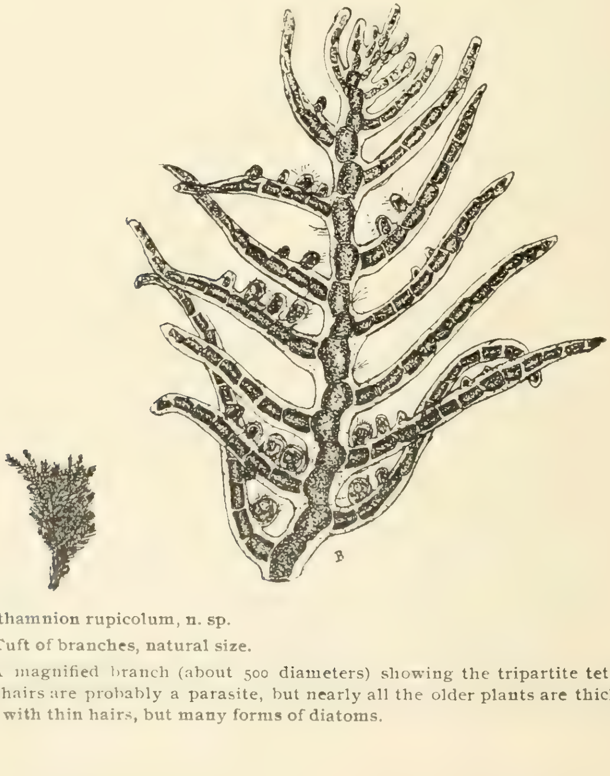
This long known alga, found in the Mediterranean and Adriatic Seas and on some Atlantic Coasts, has recently been discovered in Monterey and Carmel Bays. "Worms" is the common name in these localities, and very appropriately, for the

frond is so lubricous that it seems to creep until thoroughly dried. Our plant does not materially differ from the European except in being more robust. The fronds are mostly simple, occasionally branching dichotomously. I have only examined the cystocarpic plants, finding the fruit abundant, borne in the fan-shaped filaments near the surface of the frond.

CALLITHAMNION RUPICOLUM, *n. sp.*

(*Class* RHODOPHYCEÆ. *Order* CERAMIACEÆ.)

Fronds densely tufted, twisted, and matted at the base; alternately pinnate, pinnæ rather long and slender, distichous, emerging near middle of articulation; angles of axis obtuse. Tetraspores tripartite, oblong or obovate, borne almost always on upper side of ramuli, and near middle of articulation. The whole



Callithamnion rupicolum, n. sp.

A. Tuft of branches, natural size.

B. A magnified branch (about 500 diameters) showing the tripartite tetraspores. The fine hairs are probably a parasite, but nearly all the older plants are thickly beset not only with thin hairs, but many forms of diatoms.

plant is at times beset with very small radiating articulated threads (parasites ?). Color reddish brown. A small alga ¼-1 inch high, forming in patches on rocks and sides of cliffs at high water mark.

It is with reluctance that I add another name to the long list of Callithamnions, now already numbering more than two hundred. But this little plant, so small, so abundant, is not like any in my herbarium; and finding no description of it, I venture to enlist it as new, having but little doubt.

It grows abundantly about Monterey Bay, and I have received a specimen from Mrs. Bingham, of Santa Barbara. It may readily be distinguished by the following characters: The tetraspores and ramuli emerge near the middle of the articulation; its small size; its perennial growth; its reddish brown color; and growing on rocks and sides of cliffs at high-water mark.

BONNEMAISONIA HAMIFERA, Hariot.

(*Class*, RHODOPHYCEÆ; *Order*, LAURENCIACEÆ.)

This unique and very pretty alga has but recently been described by Mons. Hariot coming from Japan. Professor Farlow of Harvard, has had specimens from Santa Barbara but for a time considered them the same as *B. asparagoides*, Woodw., of the Irish Coasts.

In 1892 Mrs. Winston, Bradley M. Davis, M. A. Howe, and others collected specimens near Pacific Grove. Plants having been sent to Professor Farlow he has kindly determined them.

In the March number of *Erythea* for 1893, Mr. Howe publishes this alga in a list of his collections on Monterey Bay. As he truly says, "it is beautiful and noteworthy." One of its striking features is remarkably well-formed imitations of *fish-hooks* at and near the tips of the branchlets, much like those of *Hypnea musciformis* but more graceful.

DASYA COCCINEA, *Huds.*

(*Class*, RHODOPHYCEÆ; *Order*, RHODOMELACEÆ.)

This beautiful alga has been collected in Monterey and Carmel Bays for some years; but until the summer of 1892 was not recognized as the old world Dasya, first described by Hudson in

Flora Anglica about the beginning of this century and named *Conferva coccinea*. Afterwards C. Agardh placed it in the genus Dasya.

I am indebted to Mrs. B. C. Winston of Pacific Grove for calling my attention to it, and for a specimen. It is by no means abundant, but serves as an example of the curious fact that many European Algæ which do not appear on our Atlantic Coast are found on our Pacific Coast.

ON THE OCCURRENCE OF NYCTINOMUS MOHAVENSIS IN THE SANTA CLARA VALLEY.

BY J. M. STOWELL.

In the early part of last February the writer was informed by Mr. Edward M. Ehrhorn, Horticultural Commissioner of Santa Clara County, that the Court-house in San Jose was infested by large numbers of bats, which were taking refuge behind the iron window-shutters and disturbing the course of Justice by their constant chattering. A visit to the Court-house on February 27 showed that the state of affairs had not been exaggerated. On opening the leaves of one of the shutters, the bats were found thickly clustered in the darker recesses. They seemed extraordinarily clumsy and made little attempt to escape, only a few fluttering away after having fallen from their perch. About seventy specimens were procured and prove to be representatives of *Nyctinomus mohavensis*, with Merriam's rather meagre description of which (N. A. Fauna, 2, p. 25) they entirely agree. This species was described apparently from a single specimen procured at Fort Mohave, Arizona, March 8, 1889, since which no additional specimens seem to have been recorded. The present discovery of the species in the Santa Clara Valley gives a notable extension to its range.

We have been unable to compare *N. mohavensis* with the closely-allied *N. brasiliensis*, and Dr. Merriam neglects to point out the characters distinguishing the two species. Dr. Harrison Allen informs us that he considers both *N. mohavensis* and *N. femorosaccus* as at best geographical races of *N. brasiliensis*.

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As the first two, however, are described from essentially the same region, it would seem impossible to treat them as subspecies; and as our specimens without exception agree with *mohavensis* in the characters by which it is said to differ from *femorosaccus*, it seems best to recognize the two as valid species until further comparison is possible.

The specimens taken February 27 were all procured from the shutters of one window on the western side of the building, and consisted of males and females in about equal numbers. A second visit to the Court-house on March 3 resulted in the capture of sixty-seven additional specimens. Of these, thirty-two were taken from behind one shutter again on the west side of the building, and consisted, as before, of both sexes about equally represented. The rest of the second catch, thirty-five in number, were taken from behind four different shutters on the east side of the Court-house, and proved on examination to consist of females exclusively. This furnishes additional evidence that under certain circumstances the sexes congregate separately.

Several specimens of this bat have since been taken on the University Campus, and at the Hopkins Seaside Laboratory at Pacific Grove. We have also had the privilege of examining a specimen collected at San Diego, Cal., by Mr. C. H. Marsh. In this the lower incisors were 3-3, distinctly bilobate, and in general proportions, and shape of ear, it agreed with our specimens.

Le Conte has already called attention to the variation in the number of lower incisors in *Nyctinomus brasiliensis* ("*Rhinopoma carolinense*"), as out of fifteen individuals examined by him "one had no incisors on the lower jaw; two had five; three had four, and the rest six."* The same variation obtains in *mohavensis*. Merriam describes the lower incisors as 2-2, not distinctly bifid. But the normal arrangement appears to be 3-3, all distinctly bilobate. Thus in forty-five specimens examined as to this character, 24 specimens have 6 lower incisors; 9 have 5, and 12 individuals have 4. The outer incisor when present is very small, and so crowded forward as to occupy a precarious position in front of the canine, a fact which may account for its

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* Observations on the North American Species of Bats, John Le Conte Proc. Acad. Nat. Sci., Phila., 1859, page 431.

absence in so many specimens. In by far the majority, the incisors are distinctly bilobate and the lobes have well-rounded tips; but in some specimens the tips have become more or less worn, and in a few individuals this process has proceeded so far that the upper edges of the teeth are truncate, with scarcely a trace of the median notch. In the specimens examined we have noticed that most of those with perfectly truncate incisors have the latter also reduced in number. This probably indicates that both conditions are dependent upon age.

The upper lips are pendulous, and are crimped into seven or eight perpendicular folds; and the lower lips are heavy but not crimped. The color is sooty on upper surface, with the base of the hairs whitish. The ventral surface is lighter.

I give below measurements in millimeters of eleven of these specimens. It will be seen that they agree very closely with Merriam's type of the species.

Sex.	Total Length.	Length of head and body.	Length of head.	Ear from base of antitragus.	Ear from crown.	Height of tragus.	Tail to end of vertebræ.	Exserted part of tail.	Length of humerus.	Length of fore-arm.	Length of metacarpal.	Length of 1st phalanx.	Length of 2d phalanx.	Length of 5th finger.
♂	91	59	21	17	13	3	33	22	26	41	42½	16	15	41½
♂	94	59	22	18½	13½	3	34	22	27	43½	43	17	16¼	42
♂	89½	57½	21	17	12½	3	30½	17	24	44	43	17½	17	43½
♀	89½	58	21	17	14	3	32	22	25	42	44	16½	15½	42
♀	94	59½	21¾	18	13	3	32	19½	26	44	44½	17	16¼	44
♀	92½	57	21½	18	12½	3	34½	22	24	43	44½	17	16½	43
♂	89½	57	19½	17¾	12	3	33	18½	24½	42	42½	16	15	42
♂	93½	58¾	20	17½	12½	3	33	19	25	42½	43½	17	16	44
♂	93½	59	20	17½	14	3	34	20	26	42	43	16¾	16	44
♀	89	59	20½	17	12	3	33½	18	26	42½	44	16	15	43
♀	93	59	19½	16	13½	3	34	21	24½	41	43	16	15	42¾

Zoological Laboratory, Leland Stanford Junior University, Jan. 12, 1894.

TAR AND FEATHERS.

BY A. W. ANTHONY.

Anyone who has collected sea birds along the Coast of Southern California has doubtless noticed a peculiar soiled condition of many of his specimens, consisting of a sticky, black substance or black stain of greater or less extent, on the breast and sides, which is frequently of such extent as to render the specimens unfit for the cabinet. Loons, grebes, and fulmars

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seem to be the birds most effected in the region of San Diego, but all of the common species are apt to show black blotches at times. For a long time after the condition was first noticed I was at a loss to account to my own satisfaction for the origin. The theory that the birds had been feeding about the carcass of a whale or seal and gotten their plumage greasy from that or other sources was anything but satisfactory in view of the appearance of the stain and the species affected. Western grebes and Pacific fulmars—white phase—were sometimes seen with the entire lower plumage matted into a solid black mass, and not infrequently such birds were found dead on the beach. Whether their death was caused by the condition of their plumage I am unable to say, but from the appearance of some of the worst cases I should say that it probably had something to do with it.

As such specimens were so obviously worthless I have carefully avoided them, and until the present season my observations were limited chiefly to the living birds and those but little affected.

On July 11 of the present year, however, a *Puffinus griseus* was shot off San Diego and while the feathers of the left side and flank were glued together in a solid sheet it was by far too desirable to discard on that account, and an effort was made to save it, and after a liberal application of gasoline it was admitted to the cabinet minus a part of its plumage that was uncleanable.

This specimen—the first that had fallen into my hands in a condition suitable for examination—explained very clearly the mystery of the many stained plumages; it was due solely to a sticky, soft mass of asphalt.

I have frequently found small blotches of this substance varying from the size of a postage stamp to several inches or a foot in diameter floating about on the surface of the sea, evidently coming from some submarine source to the north, where the oil shales reach the Coast in the region of Santa Barbara.

This substance when it first comes to the surface contains enough volatile matter to render it about the consistency of molasses, and cause it to stick to anything with which it comes in contact. As the volatile gases escape it becomes hard and tough, encasing the bird that is so unfortunate as to swim into a floating mass in a coat more suitable for a turtle or armadillo than a member of the feathered kingdom.

CONTRIBUTIONS TO WESTERN BOTANY VI.

BY MARCUS E. JONES.

I. THE NAVAJO BASIN.

I propose this name for that region, both botanically and zoologically interesting, which occupies Southeastern Utah, Southwestern Colorado, Northwestern New Mexico, and Northeastern Arizona, whose limits are fairly well defined by the Colorado River and its tributaries north of the entrance of the Grand Cañon (the junction of the Little Colorado and the Colorado) as far as the Book Cliffs on the north with a northern and narrow extension along the Green River at least as far as the base of the Uinta Mountains. Its western boundary is the base of the Coal Range (Wasatch Plateau of Powell) in Utah, the Henry Mountains, and the Buckskin Mountains on the southwest. Its eastern boundary is the high country east of Grand Junction, Colorado, extending thence east of south past the base of Mt. Sneffles and thence along the edge of the mesa country through Southern Colorado and south as far as Coolidge, New Mexico, thence following the base of the northern slope of the Mogollons and including the valley of the Little Colorado to the base of the San Francisco swell near Cañon Diablo and thence north to the Colorado River. This large and isolated region belongs almost wholly to the Upper Sonoran of Merriam, and is to be considered as a subdivision of that region with a fringe of the Transition group on its edges. It has been isolated since the Miocene Tertiary, or at least since the Pliocene with its present drainage, and has been surrounded on all sides by lofty and cold mountain barriers from 7000 to 10,000 feet in average height above the sea with the exception of a very narrow stretch of country only a few miles wide and about 5000 feet above the sea from Johnson, Ariz., and Kanab, Utah, to the Colorado River, which connects with the narrow belts along the rivers belonging to the Upper Sonoran. This narrow plateau belt below Kanab has very few plants that might be classed as Upper Sonoran, but is the lowest possible ingress to the basin except the precarious one along the dark gorge of the river itself where there is very little

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vegetation as whole, and no possible means of distribution of seeds except that of the wind and birds, the former quite strong and the latter very scarce. The elevation of the region is at its lowest along the river at or near Lee's Ferry, about 3000 feet above the sea, and is warm enough for figs, almonds, and possibly oranges; the upper end is at Green River, Utah (not Wyo), and Grand Junction, Colorado, a little over 4000 feet above the sea, and a most admirable place for grapes, peaches, etc. The rainfall will not average over ten inches and for the most part will not exceed six inches. The soil is a tenacious and very barren clay for the most part, though it is gravelly and sandy on the mesas bordering the region. The species of plants found peculiar to it so far are about sixty, possibly not so many; the species of mammals and reptiles, etc., so far found are about a dozen. There are a number of new insects, but I do not know just how many. The number of species that are identical with the Upper Sonoran of S. Utah and N. Arizona is not very great, but the general character of the life is Sonoran. The climate is very hot and dry; water is scarce except on the rivers which simply pass through the region. The region is almost uninhabited and never can support much life; game is scarce, and it is a veritable desert. The country is simply a great trough with branches, and is bordered with lofty cliffs of crumbling sandstones of Triassic age which make it a very difficult thing to traverse it except by long detours. At some other time I will try to give a list of the flora and fauna of the region, and show its relation to the surrounding ones.

II. SOME NEW SPECIES.

PHLOX ALBOMARGINATA n. sp. Allied to *P. cæspitosa*, densely matted flowering stems mostly simple, 1 to 3 inches high or none, erect or ascending, 1 to 3 flowered, usually 1-flowered; leaves 2 to 3 lines long, 1 to 1½ wide, rigid, spreading, acerose, ovate to lanceolate, usually the latter; general appearance light green, mid-rib narrow and not prominent, margins cartilaginous, thick, white, glabrous except the coarsely hispid ciliate base, inner surface (that inside the cartilaginous edge) dark green, rather loosely pubescent, with short, coarse, white hairs on both sides; internodes longer than the leaves, angular, white

pubescent, with the same kind of hairs; the leaves are in pairs, with fascicles of smaller ones in the axils; upper part of stems, peduncles, leaves, and calyx very glandular as well as pubescent with coarse hairs; pedicels stout, 2 to 4 lines long; calyx narrow, 4 lines long, tube with teeth 2½ lines long, the former 5-nerved prominently and the nerves with narrow green margins; calyx lobes very narrowly subulate, acerose, 1 to 1½ lines long, not spreading much; corolla purple or lighter, purple spotted at the throat, tube ½ a line wide at base and a line wide at apex, 1 to 2 lines longer than the calyx and teeth, lobes oval, entire, 2 lines long; flower 5 lines wide; stamens very unequally inserted, small, oblong, yellow; capsule 1½ lines long, exactly oval, obtuse, apiculate with the sharp vestige of the long (4 lines) style, the point of insertion of the capsule is very weak, and the capsule readily breaks away and falls off leaving an empty calyx; lobes of the style about ⅓ a line long; placental axis is triquetrous, with one large oblong seed attached by its inner face in each cell above the middle of the concave placental wall.

This unique Phlox in its foliage resembles *Galium Mathewsii* or *stellatum*. The glandular pubescence at once separates it from any other of its class. Sometimes the stems are absent and the single flowers arise from a rosette of very short (1 to 1½ a line) leaves, on pedicels 4 lines long and with a calyx only 2 to 3 lines long; corolla not reduced. This form I call var. *minor*.

East face of Mt. Helena, Montana, May, 1891. Rev. F. D. Kelsey.

ASTRAGALUS EASTWOODÆ Jones. *A. Preussii* var. *sulcatus* Jones "Zoe" iv, 37; as *A. Sulcatus* is preoccupied.

ASTRAGALUS HAYDENIANUS Gray. This rather pretty and very odoriferous plant is of late receiving fully as many synonyms as *A. lentiginosus*. In fact, every time it has been collected but twice it has received a new name. As I have shown in "Zoe" ii, 241, there is nothing to separate it from *A. bisulcatus* except its more slender habit and white flowers. For convenience I there separated two western forms of it as var. *major* (from Johnson, S. Utah) and var. *Nevadensis* (from Palisade, Nevada). Lately Mr. Greene visits my type locality and probably the very field

where I gathered the latter variety and describes it as *A. demissus*, then Mr. Sheldon, by the aid of the Index Kewensis, gives Mr. Greene's species a new name, *A. Jepsoni*, and my first var. another, *A. scobinatulus*. An examination of Mr. Greene's description shows that his specimens, though from the type locality of the var. *Nevadensis*, are pubescent and have unequal calyx teeth. As it is the fashion now to name everything in sight, I would suggest that the var. *Nevadensis* is fully as distinct as any of the other forms, and as the name is preoccupied (Index Kewensis) it is waiting for a brand new name and will be the property of the first man who gets into print.

Sometime botanists, when they get into the field, will learn that pubescence and comparative length of calyx teeth are slim foundations on which to hang species, in *Astragalus*.

ASTRAGALUS ARTEMISIARUM. *Astragalus Beckwithii* var. *purpureus* Jones "Zoe" iii, 288. Recent studies in the field make it reasonably certain that this is distinct from *A. Beckwithii*. The chief distinguishing characters are the purple flowers, rather cartilaginous pods with the interior filled with a watery juice and stipe with a fully formed joint near the middle. *A. Beckwithii* has ochroleucous flowers a dry and rather thin pod without watery juice and a joint in the stipe which is often reduced to a dark spot in the stipe which does or does not break at that point and generally irregularly.

THE DATES OF BOTANY BEECHEY, FLORA BOREALI-AMERICANA, AND TORREY & GRAY'S FLORA.

"FLORA BOREALI-AMERICANA W. Hooker.

This work came out in parts, but as was usual at that time no official statement was published as to the dates of publication. Consequent upon this, doubts as to the actual publication of many species therein contained have been rife. The following details may help to settle those questions:

Vol. i Part 1, consisting of six sheets, pp. 1-48, came out in 1829 (cf. Linnæa, v, 1830, Litt. 102); and Seringe, *Bull. Bot.*, i (mars, 1830), 49.

Parts 2 et 3, p. 49–144 in 1830 (cf. Linnæa, vi (1831), Litt. 154).

Parts 4 to 6, end of vol. i in 1834 (cf. *Ann. sc. nat.* Ser. II, tome iii (1835), 109, "Livr. 3–7."

Vol. ii, Part 7 in 1834. See last note.

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The following dates are taken from the copy in the Library of the British Museum, as those when the respective parts were received by the Principal Librarian and denoted by stamping:

Part 8, pp. 49–96 in July, 1838.
Part 9, pp. 97–144 (same date).
Part 10, pp. 145–192, Jan. 1, 1839.
Part 11, pp. 193–241, Nov. 15, 1839.
Part 12, pp. 241 to end, July 8, 1840."

—B. Daydon, Jackson, in *Bull. Herb. Boissier*, i, 298 (1893).

"The copy of Torrey & Gray [Flora of North America] in the library of the British Museum. Bloomsbury, is in its original buff paper wrappers, and from this I can submit the following statement as accurate, so far as the dates are correctly set out on these wrappers:—

Vol. i., Part 1, pp. 1–184, July, 1838.
Part 2, pp. 185–360, October, 1838.
Part 3, pp. 361–544, June, 1840.
Part 4, pp. 545–698, Index (711), Title, etc., pp. xiv., Errata, June, 1840.

Vol. ii., Part 1, pp. 1–184, May, 1841. The wrapper has no printing on it, but I have taken the date from *Silliman's Journal*, xli. (1841), p. 275.
Part 2, pp. 185–392, April, 1842.
Part 3, pp. 393–504, February, 1843.
No more issued.

The case of Hooker & Arnott [Botany Beechey] is not so easy, for I have not succeeded in finding any copy with the original wrappers, and the following dates can only be taken as probable. If any reader of the *Journal of Botany* has access to such a copy, and would communicate to me the actual printed dates, I should be extremely obliged.

There is no difficulty in ascertaining the date of the first part, as several announcements concur; thus in *Linnæa* the issue is given as containing pp. 1–48, with ten plates, and came out in 1830. As I have failed to find more than occasional allusions during the progress of the work, I have pieced together all such indications, and assuming that each part was of the same dimensions as the first, I have referred to Pfeiffer's *Nomenclator* for the dates of all new genera as below, as the dates therein given must have been gathered from some copy:

Part 1, pp. 1–48, in 1830 (as above).

Part 2, pp. 49–96, in 1832 (*Pterochilus*).

Part 3, pp. 97–144, in 1832 (*Adenostoma*).

Part 4, pp. 145–192, in 1833 (*Layia;* see also Torr. & Gray, ii., 392, in confirmation).

Part 5, pp. 193–240, in 1836 (*Anisopappus*).

Part 6, pp. 241–288 (no indication of date, owing to the absence of any new genus).

Part 7, pp. 289-336 in 1840 (*Heterocentron*, etc., and several cited by Endlicher in that year).

Part 8, pp. 337-384, in 1840 (*Atenia*, etc.)

Part 9, pp. 385-432, in 1841? (*Grayia*, etc., cited by Endlicher in 1842).

Part 10, pp. 433-(486), in 1841 (*Sinclairia*).

The latter half of the work is especially open to doubt, for *Silliman's Journal*, xxxix. (1840), pp. 172-3, states that parts 9, 11, and 12 came out in 1839 or 1840, the twelfth being the conclusion; and, if correct, this shows that the latter parts were not of the same dimensions as the first part. It is in this direction that I seek for further information from any Botanist or Librarian who can enlighten me."—B. DAYDON JACKSON, in *Journal of Botany*, Oct., 1893.

The following extracts from Silliman's Journal show the approximate dates of the concluding parts of Botany Beechey and the Flora Boreali-Americana. It must be remembered, however, that communication at that time was not so frequent and so rapid between Europe and America as at present, and that we have no means of knowing how long the papers were in the hands of the editors.

Hooker and Arnott, the Botany of Capt. Beechey's Voyage, etc., Part ix., 1840. (London).—This work has extended to four hundred and thirty-two quarto pages, and another fasciculus will perhaps complete the work, but of this we are uncertain. The number of plates already cited is ninety-nine, of which eighty-nine are published. * * * —*Silliman's Journal*, xxxix, No. 1, 172-3, April-June, 1840.

Hooker and Arnott's Botany of Capt. Beechey's Voyage; part 10, 1841 (tab. 90-99).—The tenth and last fasciculus of this work concludes the account of a collection on the Pacific coast of Mexico, and is terminated by a complete index. The ten plates it comprises are nearly all devoted to Californian plants described in prior fasciculi; among which *Pterostegia*, a curious Polygonaceous genus, *Anemopsis Californica* of Nuttall, and *Lophochlæna* of Nees, a singular grass, are the most remarkable.—*Silliman's Journal*, xli, 374, July-Sept., 1841.

Hooker, Flora Boreali-Americani, or the Botany of the Northern parts of British America, etc., part xi., 1839. (London).—The eleventh part of this work has just reached us; and as the twelfth and concluding portion may soon be expected, we hope to give in the following number of this Journal a more particular notice of Sir William Hooker's most important and extensive labors in North American botany. For the present we may merely state that the eleventh fasciculus comprises the Orchideous, and the Irideous and Cyperaceous plants, and a portion of the grasses. * * * —*Silliman's Journal*, xxxix, No.1, 172, April-June, 1840.

Hooker's Flora Boreali-Americana, or the Botany of the Northern parts of British America, 2 vols. 4to. 182-940.—The twelfth part, which contains the

remainder of the grasses, the ferns, and the small orders allied to the latter, brings this important work to a conclusion within the limits prescribed. * * * This fasciculus contains twenty plates (making the whole number 238). * * * —*Silliman's Journal*, xl, 173, Oct.–Dec., 1840.

THE LAST LETTER OF DR. GRAY.

SUNDAY EVENING, November 27, 1887.

DEAR DR. BRITTON—I wish to call your attention either in a personal way or in the "Bulletin," if preferred, to a name coined by you on the 223d page of this year's "Bulletin."

"Conioselinum bipinnatum (Walter, Fl. Car. under Apium), Britton. Selinum Canadense, Michx., 1830."

I want to liberate my mind by insisting that the process adopted violates the rules of nomenclature by giving a superfluous name to a plant, and also that in all reasonable probability your name is an incorrect one.

Take the second point first: On glancing at the "Flora of North America," of Torrey and Gray 1, 619, where the name Conioselinum Canadense legitimately came in, you will notice that the name Apium bipinnatum, Walt. is not cited as a synonym; also that the synonymous name of Cnidium Canadense, Spreng., is cited with "excl. Syn." This Apium bipinnatum, Walt., you might gather was one referred to. Sufficient reason for the exclusion by Dr. Torrey might have been that Michaux's plant was a cold northern one, which nobody would expect in or near Walter's ground—the low and low-middle part of Carolinia. Besides, the preface of that Flora states that Walter's herbarium had meanwhile been inspected by Dr. Torrey's colleague, who may now add that the Apium bipinnatum is not there. So that the name you adopt rests wholly upon a mere guess of Sprengels, copied by De Candolle, dropped on good grounds by Torrey, but inadvertently reproduced in Watson's "Index," copying De Candolle. I suppose you would not contend that a wholly unauthenticated and dubious (I might say, doubtless mistaken) name, under a wrong genus, should supersede by its specific half a well-authenticated and legitimate name. And I am sure that you will not take it amiss when I say that very long experience has made it clear to me that this business of determining rightful names is not so simple and mechanical as to younger botanists it seems to be, but is very full of pitfalls. I trust it is no personal feeling which suggests the advice that it is better to leave such rectifications for monographs and comprehensive works, or at least to make quite sure of the ground.

We look to you and to such as yourself, placed at well-furnished botanical centres, to do your share of conscientious work, and to support right doctrines. So I may proceed to say that, upon the recognized principles since the adoption of the Candollian code, your name of Conioselinum bipinnatum, even if founded in fact, would be inadmissible and superfluous.

By a corollary of the rule that priority of publication fixes the name, taken along with the fact a plant-name is of two parts, generic and specific, it follows that in any case Conioselinum Canadense is the prior name for those who hold to the genus Conioselinum. I have laid down what I take to be the correct view as to this, in my "Structural Botany," paragraph 794, where it is supported by the high authority of Bentham. I believe it is more and more acceded to by the most competent judges. There are those who make transpositions of divorced halves of plants' names, and who also make the law of priority mechanically override other equally valid laws without regard to sense. To such the old law maxim of the elder De Candolle was applied—*summum jus, summa injuria*. If you like to adopt their ideas, you have at hand a still older, the very oldest, name, namely Conioselinum Chinense, for I can certify that the plant we are concerned with is Athamantha Chinensis of Linnaeus. Very truly yours,

ASA GRAY.

The following comments from the Journal of Botany (London), may be of interest.

["In this Journal for 1892, pp. 254, 318, reference was made to a letter—the last written by Asa Gray—which, owing to circumstances not very clearly related, had never been published. The volume of the *Letters of Asa Gray*, just issued by Messrs. Macmillan, contains the document in full, and we here reproduce it.

"The circumstances connected with its writing and subsequent non-publication require to be stated: That Asa Gray was willing it should be published, the letter itself makes clear; that he considered it important is plain from the passage in the *Letters* which introduces it: 'On Sunday [Nov. 27] his pulse and temperature had improved so much that he was allowed to get up and go down-stairs at noon, the doctor congratulating him on the success of the treatment. There seemed a weakness of the right hand, which, however, passed away, and he wrote that evening the letter to Dr. Britton, which follows, and when remonstrated with for making the exertion said 'it was important, and must be written.' He died on the 2d of the following February.'

"Mankind has always attached a special interest to the last utterances of great men, and it might have been supposed that Dr. Britton would have hastened to avail himself of the permission expressly given by the writer to publish in his *Bulletin* the last contribution ever made by Asa Gray to the literature which he had enriched for so many years. So far, however, was this from being the case that it was not until Gray's fellow-worker himself lay on his death-bed that any knowledge of its existence was made public. Sereno Watson, in his last illness, dictated for the *Botanical Gazette* some remarks 'On Nomenclature,' which appeared in that journal for June, 1892, and which contain the following passage: 'I must express surprise that Dr. Britton has not considered it his duty to publish the last written words of Dr. Gray which were addressed to him upon this subject, and which

expressed his positive opinions upon this point.' We called attention to this in our Journal (1892, 254) in these words: 'When, in the exercise of our editorial discretion, we withheld from publication a subsequently printed note by Dr. Britton on this subject, he did not scruple to say [and to publish] that this was because we were "apparently afraid of the argument therein contained." We shall await with interest Dr. Britton's statement of the reasons which have induced him to suppress the last utterances of America's greatest systematist.'

"Dr. Britton's explanation appears in the *Botanical Gazette* for August, 1892, p. 254. He speaks of the letter as 'personal,' and, having admitted the accuracy of Dr. Gray's correction as to nomenclature, proceeds: 'The letter did not come to me as editor of the *Bulletin* of the Torrey Botanical Club, for I was not then editing that journal. I did not realize that it was intended for publication, and do not think that it was.' Moreover, having sent the letter to Cambridge, in accordance with a request, and having accepted a copy in exchange, he 'certainly never had any right to publish it after it had passed from [his] possession.'

"Commenting on the above, we said (*Journ. Bot.*, 1892, 318): 'These reasons may or may not be considered satisfactory, but we think that all botanists will regret that Dr. Gray's last utterances on a subject in which he is known to have taken a special interest were not made public.' These utterances are now before botanists, who must form their own conclusions as to the motives which have hitherto prevented their publication.—Ed. Journ. Bot.]"

SYSTEMATIC BOTANY.

BY MARCUS E. JONES.

To my mind the proper definition of the Systematic Botany, of the day and for the most part, is The Study of dried Plants in a few isolated localities remote from the Home of the Plants. This kind of scientific work is systematic and botanical, but it is not within gunshot of Systematic Botany. To claim that it is the real thing requires as much assumption as when the zoologists arrogate to themselves the term biology or natúral history.

For a long time it has been the custom of western botanists to provide themselves with the necessary literature and then study their home plants, naming such plants as accord with the descriptions given, the rest they send with such notes as they consider valuable to certain persons in the East who have been regarded as authorities. The authorities compare them with the types of species or with their notions of the types, and if

the plants do not vary too much from the species are considered the same and so named; if they deviate too much, then they are erected into new species, usually on the strength of a single specimen. The authorities put down what they consider specific characters and omit all mention of what does not strike their fancy as specific. Believing that brevity is the soul of this branch of Systematic Botany they write a few words, only a line or two if possible, and call it a concise description. The notes of the field botanist they usually have dismissed (till very recently) with a remark like this: "Flowers said to be white, but they appear to be yellow." If the field botanist has been so bold as to write out a full description of the real characters, the closet botanist will cut out all except those which strike his fancy and are found in the specimen before him, and will add such as he thinks have been overlooked by the field botanist. At last when the description is published the weary field botanist goes out into the home of the plants, where perhaps there are acres of them, and he finds that his description does not describe and is only an aggregation of meaningless words. If he becomes disgusted and writes back as I did once, complaining, he may get the reply which I received from one of the three great botanists who have recently passed away, saying: "I suppose that by this time you have learned that it is impossible to grow plants to fit the descriptions." It struck me that it was about time to grow the descriptions to fit the plants. Of late this kind of thing has become a nuisance, and field botanists have taken to describing their own species. For a time certain drastic measures were employed to prevent it, but these having failed, the botanists are now appealed to not to publish till they have seen the allied types in the East, a thing which every western botanist agrees to most emphatically if by any means he can see the types, which is not often, for with his field knowledge he could tell quickly what are valid, distinguishing characters in his proposed new species, while from the descriptions of old types alone no man could do more than guess what the real characters are in hundreds of species.

The occasional republication of an old species by a western man is pointed to as "an exasperating blunder," as "maddening," but, dear me, that does not begin to express our feelings

when we see a new monograph from men who would not know their own new species if they saw them alive, and we find them bristling with botanical sports as new species, sports which field study would have avoided. A certain genus recently monographed I tried to use and found that I had to open a seed vessel on every plant that grew in a certain patch and all manifestly from the same seed; out of the patch I had to make about three species. Some years ago I had the same laughable experience in patches of Bæria in California, also in patches of Layia; and two years ago I had the same experience with Townsendia, out of which I had to make two species from the same seed, and had a quantity of nondescript material left still waiting to be christened. There are dozens of genera that are as badly tangled as these.

I think this confusion has arisen primarily from the absence of field study on the part of the author of the species, and secondarily from carelessness in describing species, coupled with a false theory that paucity of words is conciseness. The most concise botanist of the last generation was the one who used the most words in describing his species, and the most verbose were the ones who seemed to delight in what they called "short and concise" descriptions, which have proved to be only epitaphs of unknown species buried in their herbaria, and which we western men now and then duplicate from no fault of ours. In the first place, few of us can afford to go East to find out what these species are like, and in the second place, we are not responsible for the sins of our botanical fathers and grandfathers who have caused this state of things. That we have kept up with the literature of the day and have used every means in our power to avoid mistakes goes without saying, and some of us have even gone East to study types, but it is a hardship that should not be required of us. Let the closet botanist first describe his own species so that they can be recognized by the descriptions alone before he attempts to make new ones for the field botanist, else he will cause to become a conviction what is now arising as a suspicion that imperfect descriptions are not due wholly to ignorance. If it is not possible to get accurate descriptions of western species made by closet botanists, then eastern botan-

ists who make new western species should be required to deposit types in some central place in the West where they can be examined.

There are four well marked fields in Systematic Botany in this country at present. The first is closet monographing which is all the rage, and which so far has had one fundamental defect, the lack of accurate descriptions of the actual types of the species enumerated. In place of this we are given what the author considers to be the real species as it exists in nature which may vary much from the actual type as it is found in the type specimens. This is well enough as far as it goes, and would be all sufficient if the flora were fully known, but it is not known in the West, and as a rule the monographer himself would hardly recognize his own species if he were to see them in the field, for as a rule field study is a minus quantity with him. A person might as well try to become an expert in geology without ever going out of doors as to become an authority on species by studying dried weeds. The second field is real field work occupied in the West by an increasing number of good botanists. The third field is tinkering with nomenclature, in which there are many of every shade of opinion, but all bent on getting some castiron rule in the name of botanical justice which will be just to all and injurious to none, but which when adopted will be unjust to nearly everybody, will elevate to notoriety by-gone botanists whose descriptions were for the most part a botanical farce, and will attach the names of some present botanists to hosts of species which they never saw, and to hosts of others that were created before they were born, and nearly all of which species were recognized and placed in their proper places in the vegetable kingdom by others alone. The fourth field is the accurate description of known species; this is practically unoccupied. If a score of our keenest eastern botanists would partition out among themselves the species of plants whose types are in this country and accurately and minutely describe them just as they are, arranging the species in such a way as not to duplicate parts common to several (by the use of keys), they would earn the everlasting gratitude of all botanists, cover themselves with honor, and give to our branch of science a standing for thorough-

ness which it now sadly lacks, and an impetus which would result in the speedy settlement of the classification of our flora.

The most crying need of to-day is a rule that no species shall be considered as published if it has a string of words attached to it which do not describe the species so that it can be recognized without the use of the type specimen. It is true that this would invalidate the names of almost half of our flora if it were made an *ex post facto* rule, but we need not do that; we can forgive the good old men who have passed away, but we should expect better things of the living. Among the faults in describing species there is no one more common than sawing the air with descriptions. Take *Astragalus* for example, allied species, one is described as "matted, pod inflated, flowers white, calyx long, stipules connate, leaflets 10–15 pairs." Another is described as "stems many; pod hoary, 2-celled, pointed; flowers large, keel blunt; calyx hyaline with teeth as long as tube; stipules lanceolate and acute; leaflets glabrous, obovate, acute." The person who makes such a description which would apply equally to either species thinks he has described his plant, when in fact it is only an aggregation of words with no meaning. If a person does the best he knows how he is then liable to miss some things of importance, but when he starts out to give a "short and concise" description and throws in a pinch of words and calls it a description, he feels aggrieved if he is called to account, and tries to insinuate that his critic has some personal motive for his "unjust attack!" When all the species are known it is perfectly right to omit all things of no importance, but when they are not all known and their importance misunderstood there is no botanist either with inherited or acquired acumen who can tell what are essential and what non-essential characters, and it is pure pedantry to assume it.

Another innovation in nomenclature which I think should not be overlooked is the crediting of species to men who were not their authors. I do not know who first promulgated it, but it is in the line so much cultivated of late, of ignoring and underestimating the work of field botanists. One would think the way things are going that the only persons who have any rights are the people who sit in their warm and cozy herbaria and manu-

facture species which other men have sent them at great expense of health, time and money. The hardships of field collectors are very great and so far as I know not a single man has made anything more out of it than a poor living to say nothing of profit, and when such a man names a species after having studied it in the field and then sends it on to some authority in the East with its name, and in order not to have a rupture with that authority lets him publish it for him, it is an outrage to rob the field botanist because he did not actually pay for the printing or write the words attached to it. If we are to go behind the printing as some would have us do and attach not the name of the real author of the species but the one who ostensibly published it, then another question would arise as to whether the words credited to the man who published the species were actually written by him or some clerk in his office, in that case the clerk should have the honor of the name. But what will be the result of such an innovation? Douglas' species will all be taken from him, Nuttall's are in the same condition, though they are put in quotation marks he never published them, but Torrey and Gray did. It seems to me that these notions of nomenclature are becoming more and more technical and equally unjust and will not be accepted by the majority of botanists who want to see due credit given to those who have earned it by their labor. We are losing the meat of nomenclature in the rubbish of formalism. No *ex parte* rules adopted by a few botanists will ever secure uniformity in American botany, nor will any rules stand long which ignore the rights of collectors.

NOTES FROM THE GRAY HERBARIUM.

BY M. L. FERNALD.

HABENARIA LUCÆCAPENSIS, n. sp. A foot and a half high, leafy; principal root tuber-like, an inch long, with numerous accessory fibres from the summit: leaves thin, broadly elliptical, obtusish, four inches long, half as broad, rather abruptly narrowed to a sheathing base; the lowest smaller, orbicular; the upper reduced to lanceolate acuminate bracts, an inch in length: raceme

six inches long, 8–10 flowered: upper sepal ovate-orbicular, cucullate, about three lines in length; the lateral ones ovate-elliptic, obtusish, four lines long: petals deeply two-parted, upper segment linear, falcate, obtuse, dilated at the base, ascending, nearly equalling the sepals; lower segment filiform, about an inch in length; labellum three-parted to the base; the outer segments about fifteen lines long; the middle one linear, obtuse, a third to a half as long; spur clavate, free, 14–17 lines in length: ovary angled and obsoletely winged, about equaling the bracts; the two appendages of the stigma deeply bifid; the segments linear, spreading laterally, and curved ascending, retuse.——Collected on mountains of the Cape Region of Lower California, by T. S. Brandegee, September 16, 1893.

A stout species resembling in habit *H. Michauxii* Nutt., of the Southern States, but differing in its broader leaves, longer segments of petal and lip, and shorter more clavate spur.

ALLIUM ACUMINATUM Hook. var. CUSPIDATUM n. var. Scape more slender than in the type: perianth segments *oblong*, *abruptly cuspidate*, about the length of the stamens: bulb-coats more finely and less distinctly reticulated.——Collected at Wawawai, Washington, June, 1892, by Mr. W. R. Hull (No. 619).

Professor Porter's No. 74, from Weber River Valley, Utah, seems to be a form near this, but with the perianth segments tapering more gradually to the point, and with the stamens mostly short as in the type.

TRIFOLIUM GRACILENTUM Torr. & Gray, var. INCONSPICUUM, n. var. Much smaller than the type, slender, 2–6 inches high: leaflets 3–4 lines long, on petioles ½–1½ inches long: heads 3 lines high; corolla shorter than or barely equaling the calyx.——, Roadside, San Bernardino, Cal., Parish No. 2647.

Forms of the type approach this in habit, but the corolla is conspicuously longer than the calyx, as Orcutt's No. 1004 from Tia Juana, Lower California, and Palmer's No. 583 from Wickenberg, Arizona.

PHYLLOSPADIX, ITS SYSTEMATIC CHARACTERS AND DISTRIBUTION.

BY WILLIAM RUSSEL DUDLEY.

The genus Phyllospadix, Hook., was founded on plants collected by Dr. Scouler, at Dundas Id., Columbia River, and was published in Hooker's Flora Boreali Americana, vol. ii, p. 171, London, 1838. These plants were pistillate specimens of *Phyllospadix Scouleri*, W. J. Hooker, although the author makes no mention of the diœcious character of the genus and perhaps was unaware of it, as he observes that the genus "is separated from Zostera by the single style, capitate stigma, and curious leafy border of the spadix." Not only does he make no mention of anthers but in his figures (tab. 186) are shown an ovoid ovary, the "single style and stigma," the pistils in a single row, and the retinacula forming the "leafy border of the spadix" spreading if not recurved. The spadices and pistils of his specimens must have been imperfect, for his correct figure of the plant itself enables us to know the particular form of Phyllospadix he was dealing with, and in all the specimens of this form collected along the Pacific Coast and examined by ourselves, as well as in the still more numerous specimens of *Phyllospadix Torreyi*, Wats., we find a cordate sagittate ovary, with two laminated stigmas, two rows of pistils, and the retinacula of the pistillate spadix never reflexed or spreading.

Since its first publication a diagnosis of the genus has naturally appeared in other works, among them the following general systematic treatises:

Watson, *Geol. Survey of Cal., Botany*, ii, p. 192, 1880. Bentham and Hooker, *Genera Plantarum*, iii, p. 1017, 1883. Engler and Prantl, *Die Natuerlichen Pflanzenfamilien*, ii. (1) p. 204, 1889.

Some of the omissions have been supplied—the most important being the diœcious character of the flowers,—and some of the errors have been corrected, but not all. As an example, figure B. (after Ruprecht) in Engler and Prantl ii, p. 204, is similar to Hooker's original figure of the spadix and ovaries, excepting that the two stigmas are shown. Fig. A. (also after Ruprecht) is not so good as Hooker's, not resembling the plant

as it appears in the water. The original figure opposite, on p. 205, purports to be of *P. Scouleri*, but is a drawing of the form known as *P. Torreyi*, made from an herbarium specimen evidently. The drawing of the roots, root-stock, leaf-sheaths, ovaries, as well as the extraordinary number of fruiting nodes are all uncharacteristic. Prof. Ascherson's characterization of this genus and Zostera, in the text, is however thoughtful, and correct so far as the morphology of the genus was at that time ascertainable.

In making a critical biological study of the genus, its morphology and anatomy, during the past year, for the purpose of ascertaining its relationship to Zostera, and the possible causes, under the peculiar climatic conditions of this Coast, of its evolution as a genus, I came upon certain important structural characters which had remained undescribed, and was enabled to clear away some existing misapprehensions.*

In the light of this study it has seemed desirable to recast the generic description of Phyllospadix.

PHYLLOSPADIX, W. J. Hooker.

Submersed marine plants growing along exposed shores, from low-tide level to two fathoms below, with long, grass-like leaves, and creeping, much-branched rhizomas, which cling to rocks or to a rocky substratum in sand.

Rhizoma brittle, somewhat compressed from above, its greatest diameter from .5 to 1. centimeter, nodes not well-marked, the whole branching, extending indefinitely, and irregularly knotted when old.

Roots short (2–4 cm.) stout, simple, six, eight or rarely ten, in a double row on the side of each internode, alternating right and left, in successive internodes.

Branches are on the side of each internode, opposite the clusters of roots, and on alternate sides, in successive internodes; young branches very leafy.

Leaves, .5 to 2 meters long, slender, numerous, mostly arising from the terminal bud and from short sterile branches of the rhi-

*See *The Genus Phyllospadix*, by William Russel Dudley, in the Wilder Quarter-Century Book, Sept. 1893, pp. 403–420, two plates.

zoma, and concealing the ascending flowering branches. Leaf-sheaths long, open as in Gramineæ, but each nodal leaf-sheath completely investing the rhizoma and the distal terminal and lateral buds. All nodal sheaths on rhizoma and flowering branches rent by the expanding buds, leaving only the thicker portion to support the lamina. Laminæ, linear, emarginate at the apex, smooth, 3-nerved, furnished when very young with "fin-cells," along the margin. Ligule short of two auriculate appendages.

Flowering stems ascending as lateral branches from the rhizoma, slender, naked below. They are from one-third to two-thirds of a meter to the summit of the upper spathes, and are continued to the height of a meter or more by means of the leaves and leaf-like tips of the spathes. Flowers without perianth, diœcious, arranged in a double row, on a spadix which is sessile within the spathe, but short peduncled below. Pistillate spadices in the axils of the stem-leaves and five or six centimeters in length. Staminate plants infrequent, their spadices shorter. Spadix linear, flattened, somewhat channeled, provided along each margin with a row of oblong, obtuse, incurved, obliquely ascending, chartaceous appendages (retinacula), one for each ovary or pair of anther-cells, the whole closely invested when young by the membranous spathe. The acute apex of the spadix usually projects slightly beyond the spathe proper.

Ovary cordate-sagittate affixed near the base to the spadix and terminated above by a very short style, and two thin, acuminate, irregularly-lobed stigmas which are soon deciduous. The ovaries of each row ascend, point obliquely inwards, and alternate with a pair of rudimentary anther-cells, appearing when young like the monœcious spadix of Zostera. At anthesis the stigmas only project from the spathe. The spadix and ripened pistils free at maturity from the spathe, but its retinacula never spreading or reflexed. Ovule single, pendulous and orthotropous.

Each anther, a pair of oblong linear very distinct lobes pointing obliquely upward and inward along the face of staminate spadix, the apices of each row closely adjusted to those of the opposite row. Anthers maturing in acropetal order, the male retinacula at the same time successively and permanently recurv-

ing, leaving the anthers exposed, and finally shedding the entire spathe. Anther-lobes dehiscent longitudinally, the septum between the two loculi persistent and membranous. Pollens filamentous, one-half to one millimeter long, floating on the surface of the sea, when first escaping.

Fruits compressed, beaked above, sagittate lobed below, seed coats loose and membranous. Embryo compressed consisting largely of an orbicular hypocotyl, 2-lobed posteriorly. Cotyledon thin, oblong descending between the hypocotyl lobes.

Sclerenchyma tissue abundantly developed in the flowering stems and the leaves, wanting in the rhizoma.

The genus differs from Zostera in habitat, number, size, position, and character of roots and lateral branches, in the rhizoma, the presence of sclerenchyma in the upright stems and leaves, in the diœcious spadices, in the rudimentary anthers on the pistillate spadix, in well-developed retinacula, form of ovary and hypocotyl, mode of dehiscence of anther, and the presence of a permanent membrane between the loculi of the anther-cells.

P. serrulatus Rupr., with "leaves toothed," from Alaska, may be at present dismissed as too little known, the description being based, it is said, on leaf-fragments only. Our California species approach too closely to one another; *P. Scouleri* being variable, while *P. Torreyi* is pretty constant in its characters; but from our present knowledge it would appear proper to retain them as species.

The following species are the only ones detected on the coast of California, and the only ones certainly known to exist:

P. Scouleri, Hook., Flora Bor. Amer. ii, p. 171 (1838). Flowering stems not common, peduncles short, 1 to 6 cm. long. Pistillate spadix one; rarely two are present, one at each node. Ripened pistils larger than in the following species. Leaves flat and much thinner and lighter green, but with more sclerenchyma than in *P. Torreyi;* variable in width, 1½ to 2 mm. in mature plants, 3 or even 5 mm. on young sterile specimens; sterile plants abundant, growing on the rocks in the heaviest surf and on the most exposed ocean shores. Specimens examined from Tillamook Head, Or. (Henderson), from the mouth of the Rus-

sian River, Santa Cruz, Pacific Grove, and San Luis Obispo Bay, Cal. (Dudley). Reported from Vancouver (Macoun), Columbia River (Scouler), Santa Barbara (Mrs. Bingham).

P. TORREYI Wats., Proc. Amer. Acad. xiv, p. 303 (1879). Flowering stems abundant, elongated, usually 20–30 cm. to the lowest of the two to four fertile nodes. Pistillate spadices two to five at each node, a cluster terminating the stem, each 5 or 6 cm. in length. Staminate spadices shorter and shorter stalked, three to five at each node. Ripened ovaries 5 or 6 mm. long, and nearly as broad. Leaves numerous and .5 to 2 meters long, 1 to 2 mm. wide, coriaceous, and oval in transection, dark olive-green. Sclerenchyma less abundant than in *P. Scouleri.* Abundant on the ocean shores mixed with *P. Scouleri*, but inclining more to tide-pools and protected coves among the rocks, often seeming to grow in tussocks or turfs in the sand, but really arising from sand-covered stones. Specimens examined from the Russian River, Cal. (Dudley), Farallones Ids., and Santa Barbara (Cal. Acad. Coll.), San Diego (Cleveland), Ensenada, Lower California (Brandegee), and many from Santa Cruz, Pacific Grove, and San Luis Obispo Bay, Cal. I have no doubt it extends to Vancouver and beyond, also much further south than it has yet been reported.

LOWER CALIFORNIA GRASSES.

AN ENUMERATION OF THE GRASSES COLLECTED BY MR. T. S. BRANDEGEE IN LOWER CALIFORNIA IN 1893.

BY F. LAMSON-SCRIBNER.

I have not had time nor the facilities, even if I had desired, to fall into line with the nomenclaturists of the day in this enumeration, but I have studied the plants of the collection carefully, and so far as I have ventured to name them I believe they will be understood. I have been unable to consult the collections of Bourgeau, Botteri, Liebmann, and some others, and it is very likely that I have erred in some of my determinations. I have, however, done the best that the facilities at my command would permit.

February 26, 1894.

1. TRIPSACUM LANCEOLATUM Rupr. in Benth. Pl. Hartw. 247; Fourn. Mex. Pl. Enum. Gram. 68.—El Taste, September 13 (4).

2. HACKELOCHLOA GRANULARIS (L.) OK. *Cenchrus Granularis* L.; *Manisuris granularis* Sw.—El Taste, September 11 (20). Saucito, October 15 (68).

3. ANDROPOGON SACCHAROIDES Sw. Sessile or fertile spikelets 2½ lines long, awns 10–12 lines. I have exactly the same form from San Diego, collected by C. R. Orcutt.—El Taste, September 9 (47).

4. ANDROPOGON CONTORTUS L. *Heteropogon contortus* R. & S. El Taste, September 13 (2); Pescadero, September 23 (1).

5. ANDROPOGON IMBERBIS Hack. in *Flora* 1885, 119. A form with the pedicellate spikelet awned.—Saucito, October 15 (65).

6. ANDROPOGON HIRTIFLORUS HBK. var. FEENSIS Hack. *A. feensis* Fourn.—El Taste, September 13 (31).

7. ÆGOPOGON GEMINIFLORUS HBK. var. UNISETUS Fourn. *Æ. unisetus* R. & S.—La Chuparosa, October 17 (60).

7a. ———. Var. BREVIGLUMIS, n. var. Spikelets two in each cluster, one hermaphrodite, the second reduced to a pair of aristiform empty glumes and a linear, triaristate floral glume. The empty glumes of the perfect floret very short and narrow so that the glumes appear to be awn-like from the base, subequal and about the length of the triaristate flowering glume. This is unlike any other form which I have, the nearest approach to it being No. 247 E. Palmer (1886). The details of the spikelets in this genus vary so much that I hesitate to give this plant specific rank.—Saucito, October 14 (69).

8. NAZIA OCCIDENTALIS (Nees). *Tragus occidentalis* Nees. *Lappago aliena* Griseb.—El Taste, September 11 (36).

9. PASPALUM KARWINSKYI Fourn.? Allied to *P. paniculatum* L. Nodes, sheaths, and leaves smooth, racemes 10–16, 1½ inches long, approximate; spikelets ¾ lin. long quadriseriate, obtuse, smooth.—San José del Cabo, September 2 (15).

10. ERIOCHLOA PUNCTATA Hamilton. *Nelopus punctatus* Nees.—El Taste, September 15 (41).

11. Panicum sanguinale L.—El Taste, September 9 (49); La Honda, October 22. Empty glumes densely pilose at the apex and along the margins (*P. fimbriatum* Kth.), (53).—San José del Cabo, September 2 (29).

12. Panicum ———. Allied to *P. filiforme* L. Spikes 2–5, approximate, 2–3 inches long, outer glumes ciliate and fimbriate along the margins —El Taste, September 11 (42, 43).

13. Panicum paspaloides Pers.—El Taste, September 9 (13).

14. Panicum velutinosum Nees. Agrost. Bras. 121, (*P. Petiverii* β. Trin. Icon. t. 180). Spikelets 1½–2 lines long, obovate, abruptly acuminate pointed, dark purple and pubescent towards the apex; fourth glume minutely mucronate pointed and transversely rugose; leaves narrowed at the base, not cordate.—Saltillo, September 17 (17).

15. Panicum petiverii Trin.? =No. 159 and No. 208 E. Palmer 1887 (*P. dissitiflorum* Vasey, ined.). Spikelets 1½ lines long. Outer glumes shortly and sparsely pubescent, the first 3-nerved and ⅓ as long as the spikelet, the second and third glumes 5-nerved and together with the fourth abruptly short-pointed. The fourth glume punctate striate on the back (not transversely rugose). Leaves cordate clasping at the base where they are sparingly ciliate on the margins. Racemes distant, 2 inches long, remotely flowered, spikelets solitary or in pairs on short, pilose pedicels.—Pescadero, September 23 (27).

16. Panicum avenaceum HBK. Nov. Gen. et Sp. i. 99.—El Taste, September 12 (21).

17. Panicum decolorans HBK.? Spikelets turgid, 1½–2 lines long. First glume hardly ½ as long as the spikelet, obtuse 5-nerved, the second and third glumes longer than the fourth, broadly lanceolate, subacuminate, 7–9 nerved, the third with a palea, fourth glume obtuse. Habit of *P. decolorans* as described by Kunth.—Saucito, October 14 (70).

18. Panicum compactum Sw., Griseb. Flor. Br. W. Ind. 552.— Saltillo, September 16 (22).

19. Panicum latifolium L. Sp. Pl. ed. i., *P. divaricatum*

HBK. and Am. auct.=No. 362 E. Palmer 1886.—El Taste, September 11 (23). San Felipe, September 9 (28).

20. PANICUM BREVIFOLIUM L.—El Taste, September 10 (24).

21. PANICUM COLONUM L.—San José del Cabo, September 1 (40).

22. PANICUM COLONUM—depauperate? Culms very slender 3–4 inches high; leaves narrow-linear; racemes reduced to 1–6 spikelets.—El Taste, September 11 (52).

23. OPLISMENUS BURMANNI (Retz) Beauv. *O Humboldtianus* Nees, not Presl.=No. 463 E. Palmer 1886.—Miraflores, October 13 (75).

24. SETARIA GLAUCA Beauv.—Saltillo, September 17 (32).

25. SETARIA VIRIDIS Beauv.? San José del Cabo, September 2 (46).

26. SETARIA———. Panicle branched interrupted below, caudate; bristles much exceeding the spikelets which are about 1 line long. First glume very small obtuse, 3–nerved; second glume 5–nerved, a little shorter than the flowering glume; third 7–nerved as long as the acute and transversely rugose flowering glume.=No. 191 E. Palmer 1887, also No. 957 E. Palmer 1878.—San Felipe, September 9 (45). To be compared with *S. unisetas* Fourn.

27. SETARIA SETOSA Beauv.? Spikelets 1¼ lines long, first glume acute, 3–nerved, ½ as long as the spikelet, second glume ⅓ shorter than the fourth 7–nerved; flowering glume transversely rugose and mucronate pointed.—Pescadero, September 20 (48).

28. CENCHRUS ECHINATUS L.—Mazatlan, Mexico, October 8 (79).

29. CENCHRUS PALMERI Vasey! Proc. Calif. Acad. Sci. Ser. 2, vol. ii. p. 211; grasses of the Pac. Slope t. 3.=No. 689 E. Palmer 1887, collected at Los Angeles Bay, Southern Calif. This is possibly *Cenchrus pauciflorus* Benth. Bot. Sulph. 56. Bentham's plant which was from the Bay of Magdalena is thus characterized: "Culmis suberecto, foliis glabris vix scabriusculis, involucris alternis, distantibus, pilosiusculis sub 10–fidis, spiculis subternas superantibus."—La Mesa, October 24 (12).

30. ARISTIDA BROMOIDES HBK. Empty glumes unequal, the first 2–3 lines long, acute, the second 3½–4 lines, acute or obtuse, both 1-nerved. Floret about the length of the second glume. Awns subequal, 2½–5 lines long, lateral awns slightly divergent. Callus densely barbate. Culms slender, branched, 6–12 inches high, with a narrow strict panicle 2–5 inches long. —Saucito, October 15 (66).

31. ARISTIDA SCHIEDEANA Trin. First empty glume lanceolate, acute, 3½–4½ lines long, strongly aculeolate scabrous on the keel for the entire length; second glume a little longer than the first, 1-nerved, obtuse or shortly bifid at apex, the smooth midnerve projecting as a short mucro between the lobes; flowering glume with a slender and acute barbate callus nearly ½ line long, the glume 6–7 lines long, with an awn 2 lines long, the lateral awns minute. Panicle 6–10 inches long, branches 2–4 inches, solitary or in pairs, rather rigid, widely spreading, with appressed spikelets above the middle, naked below. Culms 1–2 feet high, rather slender.—Saucito, October 15 (64).

32. ARISTIDA CALIFORNICA Thurber.—San José del Cabo., September 12 (38).

32a. ARISTIDA SCABRA Kunth, *Streptachne scabra* HBK. *Ortachne scabra* Fourn.—El Taste, September 11 (26).

33. ORYZOPSIS FIMBRIATA Hemsl. *Stipa fimbriata* HBK. Empty glumes about 2½ lines long, equaling or slightly exceeding the obovate obtuse and pilose flowering glume, shortly mucronate pointed. Awn of the flowering glume about 7½ lines long, once or twice geniculate, strongly twisted below, scabrous. Callus very short, acute, barbate. First glume 5-nerved, the second 3-nerved. Radical leaves involute filiform, about a foot long, shorter than the culm.—La Chuparosa, October 17 (72).

34. MUHLENBERGIA LAXIFLORA Scribn. =No. 1412 C. G. Pringle (1887). Empty glumes about ½ line long, subequal, obtuse; flowering glume 2 lines long narrow-lanceolate, 3-nerved, 2-toothed at the obtuse apex awned; awn 1–2 lines long. Callus barbate. Culms 2–3 feet high, simple, panicle narrow, elongated, dark purple. Perennial from a stout root-stock.—La Chuparosa, October 17 (74).

35. MUHLENBERGIA DISTICHOPHYLLA Kth.—El Taste, September 13 (33, 34).

36. MUHLENBERGIA CILIATA Kth.=No. 1435 Pringle (1887) La Chuparosa, October 21 (59).

37. MUHLENBERGIA———. Near *M. stipoides.* Annual culms cæspitose, branched, slender, with usually 7 nodes; leaves flat, spreading, 2–3 inches long, ½ line wide, sheaths shorter than the internodes. Panicle 4–5 inches long strict, base enclosed within the uppermost sheath. Spikelets 2 lines long with a slender awn 6–8 lines long; empty glumes short (about ½ line) subequal obtuse; flowering glume scabrous on the back, pilose on the margins below, apex minutely 2-toothed, awn from between the teeth; callus short, minutely barbate.—La Chuparosa, October 17 (71).

38. MUHLENBERGIA———. Culms taller and more branched than in the last (No. 71) and awns longer, 8–18 lines, otherwise the same.—Saucito, October 15 (62).

39. LYCURUS PHALAROIDES HBK.—Sierra de la Laguna, October 19 (77, 81).

40. PEREILEMA CRINITUM Presl.—La Chuparosa, October 18 (63).

41. SPOROBOLUS MINUTIFLORUS Link.? Scribner in Proc. Acad Nat. Sci. Phila. (1891) p. 299.—No. 3130 Pringle (1890) —La Chuparosa, October 17 (80).

42. SPOROBOLUS RACEMOSUS Vasey.—No. 4B, E. Palmer 1885 (in herb. mihi) and 1425 Pringle 1887.—La Chuparosa October 21 (58). Mixed with this are specimens of *Sporobolus annuus* Vasey and *Muhlenbergia ciliata.*

43. SPOROBOLUS DOMINGENSIS Kth.=No. 165 E. Palmer 1887.—San José del Cabo, September 2 (7).

44. SPOROBOLUS VIRGINICUS Kth.=No. 338 E. Palmer 1887. —Guaymas, Mexico (7).

45. SPOROBOLUS EXPANSUS Scribn. Culm stout 4–6 feet high; sheaths smooth, striate; ligule a short and densely ciliate line; lamina narrow, elongated filiform, smooth on the back, pilose above near the base and serrulate-scabrous along the margins;

panicle 1–2 feet long caudate, branches slender, erect, spreading, the lower 6 inches long, rather densely flowered; spikelets subracemose along the branches, nearly 1 line long; empty glumes unequal, the first about ½ the length of the second which nearly equals the flowering glume; flowering glume smooth barely acute, awnless, callus naked.

This grass is closely allied to *Sporobolus Wrightii* Scribn. (in Torr. Bull. ix, 103) but is apparently even more robust, panicle more elongated, branches and pedicels more slender and *scabrous* and spikelets smaller. It is possibly *Epicampes expansa* Fourn. but it certainly is as good a Sporobolus as *S. Wrightii*. Fournier enumerates twelve Mexican species of Epicampes but his descriptions are so short or incomplete that it is very difficult to make positive determinations.—Pescadero, September 23 (16).

46. DESCHAMPSIA PRINGLEI Scribn. Proc. Acad. Phila. (1891) p. 300=No. 1429 Pringle 1887.—La Chuparosa, (55).

47. MICROCHLOA SETACEA R. Br.—El Taste, September 11 (5).

48. CHLORIS ELEGANS HBK.—San José del Cabo, September 2 (6).

49. LEPTOCHLOA MUCRONATA, Kunth.—San José del Cabo, September 2 (18).

50. LEPTOCHLOA VIRGATA Beauv. var. MUTICA Fourn. Pl. Mex. Enum. Gram. 146. *Diplachne verticillata* Nees & Mey. *Diplachne imbricata*, Thurb.=No. 47, E. Palmer (1887) and No. 331 (1886).—San José Del Cabo, September 2 (8).

51. BOUTELOUA ARISTIDOIDES, Thurb. *Dinebra aristidoides* HBK.—Pescadero, September 23 (51).

52. BOUTELOUA CURTIPENDULA Gray. *Chloris curtipendula* Michx. *Bouteloua racemosa* Lag.—El Taste September 11 (3).

53. BOUTELOUA AMERICANA Scribn. Proc. Acad. Nat. Sci. Phila. (1891) 306. *Bouteloua bromoides* Lag. *Bouteloua Humboldtiana* Griseb.—La Honda October 21 (59). The details of the spikelets in this specimen agree with the figure of *Dinebra bromoides* HBK. Nov. Gen. t. 51.—El Taste, September 11 (25). In this the characters of the spikelets are those of *Dinebra*

repens HBK. as figured in Nov. Gen. Pl. t. 52. These species (*Dinebra bromoides*, *D. repens* and *Bouteloua Humboldtiana*) were united under *Bouteloua bromoides* Lag. by S. Watson in Proc. Amer. Acad. 1883, p. 177. *Aristida Americana* Sw., Obs. 41, t. ii, f. 2 (1791), cited by Kunth, is an older synonym, the specific name of which is taken up.

54. BOUTELOUA HIRSUTA Lag.—El Taste, September 12 (19).

55. BOUTELOUA POLYSTACHYA Torr.—San José del Cabo, September 2 (39).

56. PAPPOPHORUM MUCRONULATUM Nees. ?=No. 350 E. Palmer (1887). This may be only a form of *P. alopecuroideum* Vahl., but it differs from my West Indian specimens so ticketed, and it does agree very well with Doell's figure and description of *P. mucronulatum.* It is not *P. apertum* Munro, Scribn. in Bull. Torr. Club, ix (1882) p. 52. The following are some of the characters of the spikelets: Spikelets including the awns 11–12 mm. long, with usually two perfect flowers and two to three empty glumes above. Lower empty glumes ovate lanceolate, bristle-awned between the two unequal teeth at the apex, the second about 5 mm. long, a little exceeding the first. Flowering glumes broad and rounded on the back, about 3 mm. long to base of awns, densely pilose on the short and obtuse callus and on the midnerve below the middle and on the sides half way up, pubescent on the inner face above, 7-nerved. Awns 12–15, the longer ones 8–9 mm. diverging, violet-colored, strongly scabrous. The upper empty glumes with a villous tuft on the back below the middle, sides and callus naked.—Guaymas Mexico, November 7 (76).

57. MONANTHOCHLOE LITTORALIS Engelm.—Pescadero, September 23. (Mixed with No. 35).

58. ERAGROSTIS PLUMOSA Link. *Poa tenella.* Kunth. Revis. Gram. ii. 467, t. 147, not Linn. *Eragrostis ciliaris* var. *patens* Chapm.—San José del Cabo, September 2 (9).

59. *Eragrostis major* Host.—El Taste, September 11 (37).

60. *Eragrostis lugens* Nees.—La Chuparosa, October 17 (78).

61. ERAGROSTIS NEO-MEXICANA Vasey. I have this from

New Mexico, collected by G. R. Vasey 1881.—El Taste, September 9 (14).

62. ERAGROSTIS ———. El Taste, September 9 (50).

63. ERAGROSTIS LIMBATA Fourn.? =234 E. Palmer 1886.—Saucito, October 15 (67).

64. ERAGROSTIS NIGRICANS Steud. (*Poa nigricans* HBK.). This is apparently a small form of this species.—Sierra de la Laguna, October 19 (82).

65. DISTICHLIS SPICATA (L.).—Pescadero, September 23 (35).

66. FESTUCA TENELLA Willd. ? This appears to me to be only a very delicate form of *Festuca tenella* Willd. Very likely it is the *Festuca muralis* Kth. var. *pumila* Fourn. Mex. Pl. Enum., Gram. 123, without description, reference being made to No. 554 Liebmann, collected at Cerro Leon.—La Chuparosa, October 17 (61).

67. BROMUS ———. Allied to *B. Kalmii.* The species of Bromus are exceeding variable, and their determination difficult. I have nothing which matches this, but doubtless it has been published. The slender culms are about 2 feet high, and minutely pubescent; sheaths downwardly pubescent; panicle small, the axis and branches pubescent. Empty glumes unequal, the first lanceolate, acute, 1-nerved, the second oblong, obtuse, and 3-nerved; flowering glume finely pubescent all over, obtusely bifid and short awned between the teeth.—La Chuparosa, October 17 (73).

68. BRACHYPODIUM MEXICANUM Link. — La Chuparosa, October 16 (54).

69. JOUVEA STRAMINEA Fourn.? Scribner in Bull. Torr. Bot. Club, xvii, p. 226; *Rachidospermum Mexicanum* Vasey, Bot. Gaz. xv, 110.—San José del Cabo, October 27 (10).

SYSTEMATIC BOTANY OF NORTH AMERICA.

UNDER THE EDITORSHIP OF

N. L. BRITTON, Columbia College, New York City.

JOHN M. COULTER, Lake Forest University, Lake Forest, Ill.

F. V. COVILLE, U. S. Dept. of Agriculture, Washington, D. C.

EDWARD L. GREENE, University of California, Berkeley, Calif.

BYRON D. HALSTED, Rutger's College, New Brunswick, N. J.

ARTHUR HOLLICK, Columbia College, New York City.

LUCIEN M. UNDERWOOD, De Pauw University, Greencastle, Ind.

COLUMBIA COLLEGE, NEW YORK, November —, 1893.

MY DEAR SIR:—

It is proposed to publish a comprehensive, descriptive Flora of the United States and British America in the general sequence of the larger groups adopted in "Die Naturliche Pflanzenfamilien" of Engler and Prantl, thus including all the known plants of this area. In order to accomplish this, the widest co-operation of American Botanists is desired, and I am authorized by the Board of Editors to invite your interest and assistance.

The work will be issued in parts averaging about 100 pages each in royal octavo or small quarto size. About 5 of these parts will constitute a volume, and it is estimated that about 75 parts, making 15 volumes, will be required. No illustration is contemplated, but copious references to published plates and figures will be made a feature. In addition to the technical characterizations, chapters dealing with the economic, palæontologic and horticultural aspects of each order will be appended. Especial attention will be given to the verification of original descriptions, to the examination of type specimens, to the citation of type localities, and to geographical distribution.

No attempt will be made to treat the groups consecutively, but the sequence of orders being tentatively established in advance, and the number of genera and species being approximately known, it is possible to print parts of all the volumes, or of as many of them as is desired at about the same time. It is hoped that five or six parts can be issued annually, beginning in 1896. Several parts are already in preparation.

The following botanists have consented to co-operate with the editors in preparing monographs of various groups, or in superintending their preparation:

Prof. Thos. C. Porter, Lafayette College, Easton, Penn.; Prof. Chas. E. Bessey, University of Nebraska, Lincoln, Neb.; Prof. Chas. R. Barnes, University of Wisconsin, Madison, Wis.; Prof. Wm. Trelease, Missouri Botanic Garden, St. Louis, Mo.; Prof. Conway Mac Millan, University of Minnesota, Minneapolis, Minn; Prof. J. A. Arthur, Purdue University, Lafayette, Ind.; Dr. Thomas Morong, Columbia College, New York City;

February 26, 1894.

Prof. L. H. Bailey, Cornell University, Ithaca, New York; Prof. Lester F. Ward, U. S. National Museum, Washington, D. C.; Mr. O. F. Cook, Huntington, New York; Dr. William Wheelock, Columbia College, New York City.

Each monographer will be responsible for his own matter, the only restrictions placed on contributors being that they conform to a general style and to principles of nomenclature and citation, and that descriptions be extended only to an average limit of a certain number of words, this number to be hereafter determined. The treatment of these matters will be indicated by sample sheets, which will be submitted at an early date. It is expected that an approximately uniform consideration of species can be secured.

The editors believe that by prosecuting the work in the manner above indicated, it will be possible to produce a complete Systematic Botany of the country within fifteen years. They fully realize the impracticability of such a task being accomplished by a few students only, and earnestly desire the aid and support of all American Botanists. They request your co-operation, and ask that you serd a reply to this letter to the undersigned, and will welcome any suggestions that you may be pleased to make.

For the Board of Editors,

N. L. BRITTON,

Chairman.

The above circular was sent to a number of Botanists besides those mentioned in the text. While a "Flora of the United States and British Columbia" is highly desirable, a glance at the names of the proposed monographers gives evidence that if ever accomplished it will be a remarkably uneven work. The qualification for participants seems to be not capacity and attainments, but solely agreement with the peculiar nomenclatural predilections of the editors. As they, or some of them, are, however, already at loggerheads over details, the date of the completion of the work is likely to be still farther in the future than the estimated "fifteen years." K. B.

A NEW SPECIES OF BULIMULUS.

BY HENRY HEMPHILL.

EULIMELLA OCCIDENTALIS. Shell small, turriculated, white, shining, transparent, consisting of about nine rather flattish convex whorls, with a single fine, revolving, threadlike liræ

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above the periphery, and with very fine microscopic revolving striæ beneath, observable only with a good glass and light; suture deep; aperture subquadrate; lip simple, acute; columella straight.

Length—4 mill.

Breadth—1 mill.

Habitat, San Diego, California.

Station, mudflats between tides.

I collected about twenty specimens of this interesting little shell some years ago, which seems undescribed, and I take this occasion to add it to our West Coast shells.

CHARIESSA LEMBERTI.

BY J. J. RIVERS.

CHARIESSA LEMBERTI nov. sp. Form robust, prothorax widest across the middle; head and prothorax finely punctate; Elytra twice as long as wide, but widening from base to near the apex; finely punctured in a faintly longitudinal pattern and covered with very short black hair. Color: Head, basal joints of antennæ, prothorax, legs, all but the tarsi, and the whole of the underparts red of a subdued crimson. Size: Variable in both sexes from 8–12 mm.

Has a superficial resemblance to *C. elegans* Horn, but is distinguished by having its thorax flatter and wider, by the legs being red instead of black (except the tarsi), by the basal joint of antennæ being red, and by its prothorax not bearing a polished surface, as in *C. elegans* Horn, and the insect is altogether a wider species. Habitat: Yosemite. Collected by Mr. J. B. Lembert, who kindly presented it to me.

March 12, 1894.

TWO UNDESCRIBED PLANTS FROM THE COAST RANGE.

BY T. S. BRANDEGEE.

EASTWOODIA nov. gen. (pl. xxx.*) Heads homogamous, discoid, many-flowered, all the flowers fertile. Involucre short-campanulate, bracts narrow, few-seriate. Receptacle hemisphaerical, papillate by the elevated points of attachment of the flowers and their embracing paleæ. Corolla yellow, tubular-funnelform, shortly five-cleft. Stamens exserted, obtuse or emarginate at base. Style-branches flattened, stigmatic lines marginal, not extending to the tip. Akenes turbinate, obscurely angled, crowned by 5–8 paleæ.

Named in honor of Miss Alice Eastwood, curator of the herbarium of the California Academy of Sciences.

E. ELEGANS. Suffrutescent, nearly glabrous perennial ½–1 m. high, branching; stems striate, bark whitish, shreddy in age: leaves alternate, sessile, fascicled in the lower axils, linear-oblanceolate, acuminate, 1-nerved, minutely and very sparsely scabrous, somewhat succulent, 2–4 cm. long, 2–4 mm. wide: heads 1½–2 cm. broad, 1–1½ high, solitary or loosely cymose at the upper part of slender bracts, leafy shoots of the year, 2–2½ dm. long: involucre appressed; bracts corneous, whitish, 3–4-seriate, oblong-lanceolate, mucronate, the inner broader and with a scarious erose margin; bracts of the receptacle complicate, oblong, corneous, with scarious erose tip, caducous, densely glandular below the tip within as are also those of the involucre: corolla glabrous, 6 mm. long, somewhat leathery: stamens and style well exserted; style branches broad, rounded at summit, not appendaged, glabrous within nearly to the tip, hirsute on the upper half without, stigmatic lines narrow; akenes short-turbinate somewhat 3–4-angled, densely upwardly pubescent, about 2 mm. long, not contracted at the summit; pappus of 5–8 unequal, white, linear-lanceolate erose-margined, corneous, persistent paleæ, much longer than the akenes. Collected by Mr. L. Jared on the Cariso Plains; by Miss Eastwood, near Alcalde; by Mr. W. L.

* EXPLANATION OF PLATE. E. flowering branch; C. flower showing exserted stamens and style; D. bract of receptacle; B. stamens; style tips greatly magnified.

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Watts on the hills west of Bakersfield, and by the writer near the same time and in the same general region, April–June, 1893.

The affinities of this plant are with Asteroideæ, of which it has the style-tips and involucre with much the general habit of the desert species of Aplopappus, but it differs from any of the genera in its complicate-chaffy receptacle, and its pappus. The western rim of the San Joaquin Valley yet little explored may be expected to still yield many novelties.

Lepidium Jaredi. Annual, branching, 1–2 dm. high, somewhat glaucous, upper part of stem and inflorescence pubescent, with spreading hairs: leaves lanceolate, entire, or toothed: flowering branches becoming elongated, often half the length of the plant: pedicels terete, slender, spreading, in fruit, 1 cm. long, and somewhat recurved; flowers bright yellow: sepals 2 mm. long: petals a third longer, with oval or obovate blade and narrow claw: stamens 6, nearly equal: fruit ovate, glabrous, reticulate, 3–4 mm. wide and hardly as long, acute or barely emarginate, at summit, not winged; style ½ mm. long; cotyledons incumbent.

Collected by Mr. L. Jared near Goodwin, San Luis Obispo County, April–May, 1893; and near Riverdale, Fresno County, about the same time by Mr. Alvah Eaton.

ADDITIONS TO THE FLORA OF THE CAPE REGION OF BAJA CALIFORNIA. II.

BY T. S. BRANDEGEE.

The following collection was made during the months of September and October in the western part of the mountains of the Cape Region.

The particular localities explored were either previously unexplored or had been visited at a different time of the year. The rainy season of the region is in the months of July, August, and September, but little rain fell about San José del Cabo, and consequently there were comparatively small collections made in its vicinity; and the same conditions prevailed over the region

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between the high mountains and the Gulf of California, but west of the mountains the ground was well soaked by frequent showers, and vegetation was luxuriant.

The numbers of the list are continuous with those of previous ones. All above 739 are additions to the known plants of the Cape Region. The smaller numbers belong to plants which occur in the previous lists, of which better specimens or fuller material require notice, or lead to rectifications of diagnosis.

The grasses of the collection have been studied by Prof. F. Lamson-Scribner, and are not incorporated here, and there yet remain a considerable number of species, requiring careful study, which for lack of time could not be made ready for this paper.

2. THALICTRUM VESICULOSUM Lec. var. PENINSULARE. Plants about 1 m. high, glabrous throughout, excepting a minute glandular pubescence on the margins of the sheaths, somewhat glaucous; stems striate: leaves tripinnate, distant; leaflets slender-petiolulate, thin, sometimes 3 cm., but ordinarily less than 2 cm. long, green above, glaucous below, spatulate, ovate or obovate, 3–6-, commonly, 3-lobed at apex, the lobes entire: panicle loose and spreading somewhat leafy; pedicels elongated, filiform: flowers usually hermaphrodite: sepals 4, 2 mm. long, oblong-elliptic or oval, purplish, with conspicuous parallel veins: filaments filiform, flexuous, more or less dilated towards the top, in full development exceeding the linear 4–5 mm. long, mucronate anthers, ovaries about 5, stipitate; style filiform 6–8 mm. long, strongly papillose on the back, tapering to the extremity, stigmatic nearly the whole length, the thin margin rolled in: heads nodding in fruit, akenes 5–6 mm. long, usually concave on the inner angle, stipitate, tipped by more or less of the base of the style, the flattened sides and back strongly veined and nodulose.—Common at middle elevations in the mountains of the Cape Region.

This plant is geographically so far removed from the South American type that comparison of specimens may show them to be specifically distinct.

3. RANUNCULUS ABORTIVUS L. var. AUSTRALIS. Lower leaves reniform, 3–5 cm. broad, 2–3 cm. long, petals 5–6 mm. long. Perennial, flowering in August. Abundant in wet places

on the high summits of Sierra de la Laguna and San Francisquito.

740. RANUNCULUS HYDROCHAROIDES Gray. Common in wet places and standing water, at La Chuparosa and Sierra de la Laguna, the immersed plants not in flower in October, those growing in wet banks just coming into bloom.

10. LEPIDIUM INTERMEDIUM Gray. Mature specimens now collected show that the cotyledons are incumbent, and this name should take the place of *L. Virginicum*. Some of the specimens have rather conspicuous petals like the New Mexico and Texas plants.

741. CLEOME MELANOCARPA Watson. The specimens differ from Dr. Palmer's Chihuahua plant in having slightly narrower pods. The petals are white, but the plant does not belong to the § *Physostemon*. It is common in September on the Pacific slope of the mountains.

742. IONIDIUM PARIETARIÆFOLIUM DC. (?) The same plant as Dr. Palmer's No. 93, 1885, from Chihuahua, Proc. Am. Acad. xxi, 415.—Common in the elevated region west of Sierra San Lazaro.

743. ALSODEIA PARVIFOLIA Wats (?)—Mountains east of Pescadero, September 16, 1893.

744. POLYGALA GLOCHIDIATA HBK. Cañon Hondo. Seen in but one locality.

36. PARONYCHIA MONANDRA Brandg. This grows abundantly about the Sierra de la Laguna. It seems to be the same as *P. Mexicana* Hemsley, excepting that the flower has one stamen instead of five, and probably it should be considered a variety of that species.

43. TALINUM PATENS Willd. The mark of interrogation should be omitted after this species. It is very common from near the seashore to middle elevations of the mountains.

745. MALVASTRUM SCABRUM Gray. One plant only was found in Cañon San Bernardo.

746. KOSTELETZKYA CORDATA Presl. Agrees well with the description in Reliq. Hænk. The flowers are pale lilac in

color, with yellow centres; the petals reflexed.—Abundant at Santa Anita.

747. ANODA ARIZONICA Gray. Sierra San Lazaro and at Cañon Hondo. Plants much larger than those described by Dr. Gray. Collected first by Lemmon in Arizona.

748. OXALIS LATIFOLIA HBK. Common on the west side of the mountains.

749. ILEX sp.

750. ILEX sp.

751. COLUBRINA ARBOREA. High-branching small tree 6–10 m. high, 10–15 cm. thick, sparingly pubescent on the young parts, becoming glabrous: branches slender, green: leaves alternate 3-nerved, thin, ovate-acuminate, 6–15 cm. long, the nerves ending in a series of arches, running close to and parallel with the margin of the leaf, each arch ending in an impressed gland on the lower surface of the remote rounded teeth; petioles 2–2½ cm. long; stipules slender caducous: flowers greenish in axillary cymes shorter than the petioles: calyx and pedicels sparingly pubescent: petals almost without claws rolled round the filament which exceeds them: ovary not free from the disk: fruit not seen. Mountains of the Cape Region, September–October, 1893.

This may possibly be a form of "*Rhamnus glomeratus*" Benth. Pl. Hartw. 9, which is evidently a Colubrina with hardly more than a generic description.

752. VICIA EXIGUA Nutt. Sierra de la Laguna.

162. PHASEOLUS ACUTIFOLIUS Gray, var. TENUIFOLIUS Gray. *P. montanus* Brandg.

753. RHYNCHOSIA PHASEOLOIDES DC. Sierra de la Laguna.

754. CASSIA BIFLORA L.—Rather common on the western side.

755. CARICA CAUDATA. Stems herbaceous, ½–1 m. long from a tuberous root: leaves thin, triangular to ovate in outline, 3-nerved, entire or 3–5-lobed acute or acuminate, truncate or cuneate at base, 3–12 cm. long on slender petioles often exceeding the blade: ♂ flowers (only one cluster seen): peduncle 11 cm.

long, about 5-flowered; calyx $1\frac{1}{2}$ mm. long, segments lanceolate, acute: tube of the corolla slender, 10 mm. long; lobes oblong obtuse half the length of the tube: stamens 10, the 5 larger 3 mm. long, 2-celled, nearly sessile, the alternates 1-celled, 2 mm. long on filaments little shorter—the connective in both forms brush-hairy at tip: rudiment of ovary 3 mm. long: ♀ flowers not seen: fruit 1-celled, oblong-oval beaked, 5–11 cm. long on slender peduncles half as long, and with five horns 3–5 cm. long projecting backward from the base: seeds 6 mm. long covered by the milky white aril; testa rugose, crustaceous. — The first specimen was collected by Dr. Gustav Eisen. It was afterward found abundantly, in fruit, about the western side of the mountains.

756. ECHINOCYSTIS (ECHINOPEPON) COULTERI (Gray).—Cañon Hondo.

259. GARRYA WRIGHTII Torr. This species is common in the mountains, and reaches a height of 3 m. or more. The leaves are not mucronulate on the margins as are most of the Arizona forms. Specimens from the Santa Rita Mountains have nearly smooth leaf margins, while those from Santa Pedro Martir are exceedingly rough.

757. RANDIA OBCORDATA Wats.—Common at low elevations.

758. CRUSEA PARVIFOLIA Hook. & Arn. Bot. Beech. 430. Agrees very closely with the description and figure, differing only in unessential particulars.—Cañon Hondo on the western side of the mountains.

274. VALERIANA SORBIFOLIA HBK.

759. STEVIA MICRANTHA Lag. In the mountains at various places, not common.

760. EUPATORIUM SAGITTATUM Gray. Common in the vicinity of Pescadero, usually growing in brush fences. Well-known from Guaymas northward to Arizona.

293. ERIGERON SUBDECURRENS Schultz Bip. This is the *Conyza Coulteri* of the previous list.

761. CONYZA SOPHIÆFOLIA, HBK.—El Taste.

762. BACCHARIS SAROTHROIDES Gray.—Near Sierra San Lazaro.

763. GNAPHALIUM PURPUREUM L.—Sierra de la Laguna.

764. GNAPHALIUM GRACILE HBK. Growing on the sandy dry beds of streams.

765. FRANSERIA CAMPHORATA Greene. Abundant in the vicinity of Pescadero. It extends northward to the foothills of San Pedro Martir.

FAXONIA gen. nov. Heads heterogamous, radiate, flowers of the ray ♀, of the disk ☿. Involucre of few, narrow bracts, sub 2-seriate and slightly unequal, some of the outer embracing the ray-flowers. Receptacle convex, paleæ, membranaceous linear. Ligule of the ray-flowers rudimentary. Style glabrous, acuminate. Akenes somewhat curved, without pappus, apparently fertile. Flowers of the disk yellow, with deeply and somewhat irregularly cleft limb. Stamens distinct or two occasionally joined. Anthers short. Style branches linear, stigmatic on the inner surface nearly to the somewhat dilated truncate tip. Akenes with a pappus of irregular slender awns.

Named in honor of Mr. C. E. Faxon, whose exquisite drawings for the Sylva of North America have placed him in the front rank of botanical artists.

766. F. PUSILLA.* Plant (only one seen) 8 cm. high, branching from near the base, villous all over with many-jointed hairs tipped with capitate glands: leaves opposite, lanceolate, unequal-sided, 1–2 cm. long, dentate, the teeth small, obtuse, and remote, the veins marked by oil glands; petiole very slender equaling, or in the upper many times exceeding the blade, dilated and somewhat clasping at base: inflorescence axillary; heads ovate 3–4 mm. high, 10–15 flowered: bracts of the involucre 6–8, nearly equal, lanceolate, with somewhat foliaceous tips, 2–4 of them curved, complicate and embracing the ray-akenes: receptacle not villous, bracts narrowly linear more or less united: ray-flowers with pubescent tube and nearly obsolete ligule; style branches long-acuminate; akenes apparently fertile, glabrous, curved, striate, compressed. 1½ mm. long: disk flowers 2 mm. long,

* PLATE XXXI. 1, whole plant enlarged; 2, head; 3, ray-flower with embracing bract; 4, same with flower drawn out; 5, bract of the receptacle; 6, disk-flower; 7, same opened; 8, stamen.

tube densely glandular-villous, lobes linear, rather longer than the tube, pubescent, marked by oil-tubes, somewhat irregularly cleft and thickened at tip; anthers very short, oval, somewhat unequal at base, usually distinct, but sometimes 2 joined, less than ½ mm. long, including the equally long appendage; style-branches enlarged truncate and villous at tip.

767. Dysodia anthemidifolia Benth. The segments of the leaves are very broad and obtuse giving to the plant a very different appearance from the Magdalena Bay specimens.—Along the Coast below Pescadero.

Pectis Berlandieri DC.—El Taste near Sierra San Lazaro. It is the same as Dr. Palmer's No. 61 (1885) from Southwestern Chihuahua, excepting that the leaves are much broader.

349. Hieracium argutum Nutt. (?) A high mountain plant which may possibly prove distinct.

768. Erechthites runcinata DC.—In damp fields at Santa Anita where it was probably introduced.

769. Bumelia angustifolia Nutt.—Small bushy trees growing in the vicinity of Pescadero. No mature fruit was found but the flowers, leaves, and habit are of this species.

770. Diospyros Texana Scheele. "Guayparin." Probably a form of this species, but as no flowers could be found the determination is uncertain. It is a small tree and not uncommon along the base of the mountains. The leaves are two or three inches long and vary on different trees from glabrous to tomentose; the fruit about an inch in diameter is black when ripe and very pleasant to the taste.

771. Forestiera macrocarpa. A shrub or small tree, 2–6 m. high, glabrous: leaves entire, of thin texture, elliptical or oblong-ovate, cuneate at base, acutish or obtuse, 2–3 cm. long, on peduncles 4–5 mm. long: drupes solitary or few in clusters, oblong, 12–15 mm. long, dark blue; pedicels about as long as petioles; putamen curved, striate.

This species is related to *F. pubescens* and *tomentosa* but differs from both by having thinner, glabrous leaves and larger fruit. The putamen is striate like that of *F. pubescens* and the leaves as entire as those of *F. tomentosa*.—Found in fruit only,

growing along a rocky stream near Sierra San Lazaro in the month of September.

772. SARACHA JALTOMATA Schlecht. (?) From its characters nearest to this species.—Near San Felipe, where it was probably introduced.

773. STEMODIA PUSILLA Benth. Plants less hairy, corolla larger and longer as compared with the calyx, than in Mazatlan specimens.—Cañon de San Bernardo.

774. VERBENA PROSTRATA R. Br. Spikes less dense and plants less hirsute than specimens from California. Seen only in San Bernardo Cañon, where it may have been introduced.

775. VERBENA POLYSTACHYA HBK. Sierra San Francisquito, where it was doubtless introduced.

776. DURANTA PLUMIERI Jacq.—Both flowers examined had five stamens: one all perfect and the other with the fifth somewhat imperfect. Common at middle elevations on the west side of the mountains, sometimes forming impenetrable thickets.

462. CITHAREXYLUM BERLANDIERI Rob. Very nearly the same as Pringle's specimens from San Louis Potosi.—Found only about the cultivated fields of Miraflores where it is not uncommon.

777. HYPTIS SUAVEOLENS Poit.—Growing very abundantly about the ranch at La Mesa, where it was probably introduced.

778. CELTIS PALLIDA Torr.—Common about Pescadero and the western coast.

779. CELTIS RETICULATA Torr.—Small trees growing about Sierra San Lazaro.

517. EUPHORBIA HETEROPHYLLA L. A form of this variable species having the base of the floral leaves red is not uncommon in the mountains.

542. EUPHORBIA INCERTA Brandegee. This species was collected on the sea shore at Mazatlan and as it is apparently a maritime species of considerable range should have been found by other collectors.

780. BERNARDIA (?) FASCICULATA Wats. Proc. Am. Acad. xviii, 153, 1883. It belongs however to the Phyllantheæ.

781. CROTON MAGDALENÆ Millspaugh.—San José del Cabo and in the mountains. Some forms are much less pubescent or hirsute than the type from Magdalena Island.

549. CROTON FRAGILIS HBK. Var.—This is very near the variety *sericeus* of Dr. Palmer's Chihuahua collection. The specimens from different parts of the Cape Region vary from one another very much in their pubescence, those from Sierra San Lazaro being much larger and more glabrous than those from the vicinity of San José del Cabo.

551. BERNADIA MEXICANA Müll. Arg. var. *B. viridis* Millsp. This is also the *B. Brandegei* Proc. Cal. Acad. ser. 2, vol. iii, 172, which is an inadvertence, no species having been described under that name. It is a rather common bush of the Cape Region at middle elevations.

536. ADELIA VIRGATA. A diœcious shrub 2–3 m. high with whitish stems and long almost simple branches studded with stout more or less woolly spurs on which are borne the crowded leaves and flowers: leaves oblanceolate to oblong or obcordate, 1½–3 cm. long, sparingly appressed pubescent, soon glabrate, cuneate at base to a short petiole: flowers 4–6 at the summit of the spurs; pedicels 5–10 mm. long, jointed about the middle: calyx valvate, 5-parted, the segments acute, 2–3 mm. long densely villous without and within: stamens about 15 concreted at base with the rudimentary ovary. Ovary of ♀ flower sessile on the disk, 2–3- ordinarily 2-celled, hirsute; styles united at base, fimbriate-lacerate, stigmatiferous over the whole inner surface: fruit glabrate commonly 2-coccous, about 2 cm. high by 3 cm. in breadth, marked by a cruciform sulcus; seeds orbicular the size of a pea with coriaceous brown, somewhat mottled testa; endosperm thick; cotyledons reniform.—Widely spread over the southern part of the peninsula; now first collected in flower.

782. SALIX TAXIFOLIA HBK.—Growing along streams of the western side, but not abundant. Determined by M. S. Bebb.

783. ARETHUSA ROSEA Benth.— Common on the high mountains.

571. MICROSTYLIS OPHIOGLOSSOIDES Nutt.—High mountains of the Cape Region.

573. HABENARIA CRASSICORNIS Lindl. ex. char—High mountains of Cape Region, October, 1893.

574. HABENARIA THURBERI Gray.—High mountains, October 17, 1893.

784. HABENARIA DIFFUSA R. & G.—El Taste, September 14, 1893.

785. HABENARIA CLYPEATA Lindl.—El Taste, September 14, 1893.

786. HABENARIA LUCÆCAPENSIS Fernald.*—Saltillo, September 16, 1893.

787. TILLANDSIA RECURVATA L.—Growing on bushes and trees, especially on arborescent Cereus, in a gap in the mountains southeast of Todos Santos.

578. SISYRINCHIUM SCHAFFNERI Wats.—The specimens vary considerably in height and breadth of leaves. Some of them agree perfectly with No. 1376 Pringle, from Chihuahua, as nearly as can be made out from comparison with an immature specimen.—Common on the summits of the mountains growing under oaks and pines.

588. TRADESCANTIA CRASSIFOLIA Cav.—This seems distinct from Pringle's No. 1681, but it agrees with the descriptions and Cavanilles' figure quite as well. The plants are smoother and smaller than the Mexican forms and nearest the variety *glabrata*.

590. TINANTIA FUGAX Schiedw. *T. modesta* Brandg. Proc. Calif. Acad. ser. 2, iii, 175. A rather common species, found along the base of the mountains in a branching almost glabrous form, at higher elevations in a more simple and pubescent form, the sepals long-glandular hairy.

788. CYPERUS DIANDRUS Torr.—La Mesa; San Jacinto.

789. OPHIOGLOSSUM CROTALOPHOROIDES Walter.† *O. bulbosum* Michx.—El Taste.

* See page 379 preceding. The Orchidaceæ of this list were determined by M. L. Fernald of the Gray Herbarium.

† Filices determined by Prof. D. C. Eaton.

790. OPHIOGLOSSUM NUDICAULE L.—El Taste.

791. GYMNOGRAMME PEDATA Kaulfuss.—Near Mt. San Lazaro.

792. PELLÆA SKINNERI Hooker—Near Mt. San Lazaro.

793. ASPLENIUM PUMILUM Swartz.—Near Mt. San Lazaro.

794. WOODWARDIA RADICANS Smith.—La Chuparosa.

795. MARSILIA MINUTA Fournier.—San José del Cabo. Identified by L. F. Underwood.

REVIEWS.

Letters of Asa Gray—Edited by—Jane Loring Gray—in two volumes—1893—Houghton, Mifflin & Co. "It has been my aim, in collecting and arranging the 'Letters' from Dr. Gray's large correspondence, to show as far as possible in his own words, his life and his occupation. The greater part of the immense mass of letters he wrote were necessarily purely scientific, uninteresting except to the person addressed; so that many of those published are merely fragments, and very few are given completely. I have made no attempt to estimate his scientific or critical labors, for they are sufficiently before the world in various printed works; but something of the personality of the man and his many interests may be learned from these familiar letters and from even the slight notes."

From this prefatory note by Mrs. Gray the scope of these letters is at once apparent. They make the reader acquainted with the man, and sufficiently so with the student of plants to make them indispensable to every American botanist. The botanical letters of Gray are still to be hoped for in the future. Nearly every contemporary botanist in America can furnish treasured and most interesting letters from him but it may be that they were intentionally withheld for the present, on account of his well-known habit of expressing his views forcibly and unreservedly concerning all botanical subjects discussed. We reprint, by kind permission of Mrs. Gray, on page 372 preceding, the last letter written by Dr. Gray.

Die Parasitischen Exoasceen. A Monograph. By R. SADEBECK. Hamburg, 1893. In the above monograph is presented a very complete and accurate account of the peculiar group of Fungi, the Exoasceæ. The members of this family are fungi of extremely simple structure, and some of them are parasites that cause serious trouble by their ravages. Probably the most familiar species is *Exoascus deformans* (Berk.) Fuckel, the cause of the well-known disease of peach trees popularly called "leaf-curl." When the trees are severely attacked they sometimes are almost completely stripped of their leaves, resulting in a serious check to the tree's growth.

The first section of Professor Sadebeck's monograph deals with a comparative study of the development and biology of the parasitic Exoasceæ. Although many experiments were made with various species, none of the attempts to grow the spores upon artificial culture media were entirely successful, and in no cases was he able to produce spore-bearing plants in this way. In some instances, however, he was able to follow the penetration of the host by the germ-hypha of the parasite, and to trace its development within the host. The species especially studied were *Exoascus Tosquinetii* (West) Sadeb., *E. epiphyllus* Sadeb., *Taphrina Sadebeckii* Johans., as well as several other species of *Taphrina*. In the species of *Exoascus* the mycelium is perennial, and this insures the perpetuation of the fungus, even if for any reason the spores should fail to germinate.

The asci open by a cleft at the apex, and the spores are violently ejected by the strong contraction of the side walls of the ascus which are in a state of tension before it opens. Sometimes instead of the ordinary spores, yeast-like conidia are produced within the ascus, and in case the conditions are unfavorable for the formation of either spores or conidia, e. g. in very rainy weather, the asci form directly yeast-like conidia by budding.

Sadebeck separates the parasitic Exoasceæ into the genera *Exoascus* Fuckel, *Taphrina* Fries, and *Magnusiella* Sadeb. The first genus is characterized by the perennial mycelium and the fact that the whole mycelium, or at least that part under the cuticle of the infected leaf, breaks up into cells that develop directly into asci. Twenty-one species are given.

Taphrina has no perennial mycelium, and therefore is entirely dependent upon spores for its propagation. The mycelium shows a differentiation into a sterile and fertile portion, the former alone giving rise to the asci. Fourteen species are included in the genus.

Magnusiella is a new genus that differs from both of the others in its more deep-seated mycelium and the formation of asci between the epidermal cells, and not below the cuticle. Five species are enumerated.

Two non-parasitic genera, *Endomyces* Tulasne, and *Ascocorticium* Brefeld, are also included in the Exoasceæ.

The remainder of the paper is mainly taken up with a critical discussion of the parasitic genera, with descriptions of all the described species, including their geographical distribution.

The paper is well illustrated by three excellent double lithographic plates. DOUGLAS H. CAMPBELL.

Maize: A Botanical and Economic Study. (Contributions from the Botanical Laboratory of the University of Pennsylvania. Vol. i. No. 2.) By JOHN W. HARSHBERGER. This is a paper of much interest, on the structure origin, and economic importance of Indian corn.

Minnesota Botanical Studies: Bull. 9. pt. i.: I, Prefatory Note; II, The occurrence of sphagnum atolls in Central Minnesota, CONWAY MACMILLAN; III, Some extensions of plant ranges E. P. SHELDON; IV, On the nomenclature of some species of Astragalus, E. P. SHELDON; V, List of fresh water Algæ collected in Minnesota during 1893, JOSEPHINE E. TILDEN; VI, On the poisonous influence of *Cypripedium spectabile* and *Cypripedium pubescens*, D. T. MACDOUGAL.—Prof. MacMillan's paper is an attempt to account for the formation of Sphagnum atolls in lakes, with some account of the plants found on them. In No. 3 Mr. Sheldon gives a list of a number of plants either reported for the first time or rare in Minnesota, describing two new species, *Polygonum rigidulum* and *Aster longulus; Claytonia latifolia* an older varietal name is substituted for *C. Caroliniana:*

Potentilla supina var. *Nicolletii* is raised, and *Viola canina* var. *longipes* restored, to specific rank. In No. 4, the author shows that the Kew Index is not an unmixed blessing, by changing the names of a couple of dozen Astragali. Of these changes twenty-two are marked n. n., and two n. sp.; *A. scobinatulus* Sheldon taking the place of *A. Haydenianus* var. *major* which was changed because of *Astragalus glabriusculus* var. *major*, and *Astragalus elatiocarpus* Sheld. being substituted for *Astragalus lotiflorus* forma *brachypus*. *A. ceramicus* Sheld. is substituted for *A. pictus; A. ceramicus* var. *Jonesii* Sheld. for *A. pictus* var. *angustatus; A. ceramicus* var. *imperfectus* Sheld. for *A. pictus* var. *filifolius; A. accumbens* Sheld. for *A. procumbens* Wats.; *A. oblatus* Sheld. for *A. nudus* Wats.; *A. vexilliflexus* Sheld. for *A. pauciflorus* Hook.; *A. gilviflorus* Sheld. for *A. triphyllus* Pursh.; *A. gambellianus* Sheld. for *Astragalus nigrescens* Nutt. (crediting Prof. Greene by the way for "pointing out the difference between this species and *A. didymocarpus*"); *A. apilosus* Sheld. for *A. glaber* Michx.; *A. spatulatus* Sheld. for *A. cæspitosus* Gray; *A. syrticolus* Sheld. for *A. Thompsonæ* Wats. (changed on account of *A. Thomsonianus* Benth.); *A. Jepsoni* Sheld. for *A. demissus* Greene; *A. suturalis* Sheld. for *A. eriocarpus* Wats.; *A. intonsus* Sheld. for *A. villosus* Michx.; *A. umbraticus* Sheld. for *A. sylvaticus* Wats.; *A. famelicus* Sheld. for *A. fallax* Wats.; *A. asymmetricus* Sheld. for *A. leucophyllus* T. & G.; *A. Watsoni* Sheld. for *A. Hendersoni* Wats.; *A. prælongus* Sheld. for *A. procerus* Gray; *A. strigosus* (Kellogg) Sheld. (*A. hypoglottis* L. *var. strigosa Kell.*) for *A. tener* Gray, and in consequence of this change, *A. griseopubescens* Sheld. for *A. strigosus* Coult. & Fish.; *A. coccineus* (Parry) Brandegee, a synonym of *A. grandiflorus* Wats. is kept up on account of *A. grandiflorus* Pall. a synonym of *Oxytropis grandiflora*. Nearly all these names are changed on account of the "once a synonym always a synonym" rule, which is made to apply to synonyms of other genera and to varieties, not only as against younger species, but as against varieties of other species. Left to legitimate revisions it is not probable that a half dozen of these names would ever have to be changed, and in view of the vagueness of varieties in botany, and the fact that varietal names

are seldom catalogued a perfectly appalling vista of changes and uncertainty is opened to the view. It is matter of minor importance, but still to be regretted that Mr. Sheldon should have been so singularly unfortunate in the selection of some of his names.

The fifth paper is a list without notes, excepting of station, of fresh water Algæ. The sixth discusses the alleged poisonous properties of certain Cypripediums, the author concluding from his own experience that *C. spectabile* is in his case at least, a strong local irritant.

Botany of the Death Valley Expedition By F. V. COVILLE (Contr. U. S. Nat. Mus. vol. iv). This is one of the most important, as well as the most voluminous contributions to the botany of the Southwest. The chapters on "Characteristics and Adaptations of the Desert Flora" are most interesting, so also are those on distribution in which however must be taken into account the necessarily far from exact information acquired by a single expedition, which will be sufficient reason for differences of opinion not only as to many of the details of distribution, but as to the value of some of the zonal plants selected. The sixty-six pages devoted to a list of the species by numbers and to a bibliography might have been omitted as the information contained was nearly all embodied in the main list occupying the previous pages. The whole number of species and varieties enumerated including algæ and fungi is 1261 a considerable proportion of them belonging to the "Greeneian" category, and as the author remarks "It should be understood that the desert region of California of which Death Valley forms a part, does not contain all these twelve hundred species. More than one-half of them were collected either in the Sierra Nevada and its southern continuations, or in the Tulare Plains, areas with vegetation almost wholly different from that of the desert region." The paper would indeed have been of quite as much value if the long catalogue of familiar plants found along the route especially in the valley of the San Joaquin had formed no part. It adds very little more to our knowledge than would a similar list of the plants collected in an expedition from Boston to New York.

With the nomenclature of the author, as is perhaps well-known we do not agree, and especially we object to the setting aside of specific for older varietal names, as these last are seldom catalogued in works of reference the element of confusion introduced will be of very remote settlement.

We may safely rely upon Mr. Coville's future knowledge of Western plants, to convince him of the inherent weakness of the generic propositions of "Oreobroma," "Uropappus," "Ptilocalais," "Linanthus," "Allocarya," "Sonnea," "Oreocarya," "Eremocarya," "Piptocalyx," etc.

The metric system is adopted throughout the work as is now the custom in most scientific papers. — brought face to face with the kilometre we are however reminded with more than usual force of the great fault of the system—the inexcusably long terms. The author says: "To those not familiar with this system, the following table * * * will be useful." We commend this table to the printers and proofreaders of the Department especially in connection with *Erigeron calvus* described both in Proc. of Biol. Soc. and in this work as "1 cm. high * * * blades [of the leaf] 1–1.5 cm. long, tapering into a petiole of twice that length * * * heads 7 to 8 mm. high." "*Potentilla purpurascens pinetorum* * * stems about 3 cm. high, radical leaves 7 to 14 cm. long." or *Phacelia hispida brachyantha* * * * 1 to 3 cm. high * * * calyx 5 mm. long * * * in fruit reaching 10 mm. long."

The whole number of species and varieties described as new is 42. The author has described them with conscientious care and tolerable fullness. The greater number are valid as far as we can be certain from the text and the plates in which 21 of the species are figured. Very few of the types have been seen by us, but Mr. Coville promises a very welcome set to the Herbarium of the California Academy of Sciences, where it will be accessible to all botanists of the West.

Aquilegia pubescens seems too closely related to *A. chrysantha*.

Agreeing with Trelease Mr. Coville considers *T. platycarpum* as not more than a variety of *Fendleri*, he quotes in the synonymy Pitt. i, 166, but appears not to have noticed Mr.

Greene's remarks in Pitt. ii, 24 where he renames it *T. hesperium* under which name it occurs in his local floras.

Brasenia purpurea Michx. under *Hydropeltis*, 1803, is taken up in the place of *Brasenia peltata* Pursh, 1814: Brasenia was characterized by Schreber in Gen. Pl. ed. viii, 1789, and to the single species the name *Schreberi* was applied by Gmelin in Systema Naturæ, ed. iii, 853, 1791.

Argemone platyceras collected on the desert is of course the form of that species collected by the writer at one of the railway stations between Amboy and the Needles, and described by Mr. Greene as *A. corymbosa.*

Cleomella brevipes grows abundantly about Newberry Station, where it was collected in 1884.

Isomeris arborea globosa Cov. is in the herbarium of the California Academy of Sciences in every gradation between it and the typical form. Specimens collected by the writer between Caliente and Keene Station with very large globose pods have no groove in the seed. Specimens with long narrow pods from Calamajuet, Lower California have a deep groove. The same form from San Diego has no groove. All the forms grow together on the slopes of Tehachapi.

Malvæopsis is accepted by the author as the older name of Malvastrum. Mr. E. G. Baker, however, in the course of his enumeration of the Malvaceæ, says that the type of Malvæopsis was a Sphæralcea, wrongly identified by Otto Kuntze as a species of Malvastrum.

Fremontia is changed to "*Fremontodendron*" on account of the previous *Fremontia* a synonym of Sarcobatus.

Purshia glandulosa is kept up under *Kunzia.* In the opinion of the writer it is a not very distinct variety.

Mentzelia reflexa Coville was collected by the writer in the vicinity of Bagdad, on the Mojave Desert, in 1884.

Aplopappus interior Coville is evidently the form of *A. linearifolius* which prevails at a distance from the Coast. A good series of the forms approaching it would probably have modified the author's views.

Aster mohavensis Coville, "It cannot, however, retain its original specific name, since Michaux described an *Aster tortifolius* which is now referred to *Sericocarpus tortifolius.*"

Lessingia "*tennis*" Cov. *L. ramulosa* var. *tenuis* Gray, of Bot. Cal. 1. 307, and Syn. Fl. ii, 1, 162 "as to the pl. of Rothrock in Wheeler Rep. vi, 364. There is however an older var. *tenuis*, described in Proc. Am. Acad. vii, 351, belonging to *L. leptoclada* which in Syn. Fl. Supp. 447 is reduced with *L. nemaclada* Greene to *L. leptoclada* var. *microcephala* Gray. The printer has further complicated the matter by misprinting Mr. Coville's specific name, and altogether botanists adopting the Sheldonian method will have a good subject.

The specific name of *Pluchea borealis* is changed to *sericea* "(Nutt.) under *Polypappus*." The species was first published in Emory's Rep. 1848, p. 147 as "TESSARIA BOREALIS DC. An aromatic shrub about three feet high growing in all the deserted beds of the Gila, and in the Valley of the Del Norte usually with the Frémontia both of which are abundant in those regions." If this had been a plant of Rafinesque's it would have probably been considered quite well authenticated. It is certainly quite as recognizable, being placed in its proper genus, and with a definite locality, as Nuttall's later genus, sandwiched in between Micropus and Psathyrotes, and entirely without generic description, though named as a new genus, described from a single "imperfect specimen, apparently male," and with the station "Rocky Mountains of Upper California."

Helianthus invenustus Greene, was collected by Mr. Brandegee at Sequoia Mills 1892, and its peculiarities noted in Zoe, July 1893, p. 153.

Layia is maintained instead of the recently resurrected Blepharipappus under which Prof. Greene has renamed the species.

Chænactis attenuata can not be kept distinct from *C. carphoclinia*, every gradation is found between them.

Lepidospartum striatum Cov. is *L. latisquamum* Wats. Proc. Am. Acad. xxv. 133.—both described from the same plants collected by Shockley.

Adelia is taken up as an older name for *Forestiera*.

Menodora spinescens is in Shockley's collections from Candelaria.

Such species as *Navarretia setiloba* are evidence that the National Herbarium is in need of such a set of the variations

belonging to that section, as is possessed by the California Academy of Sciences.

Phlox austromontana Coville—"The No. 1839 Parish." which he includes in the type bears on the label "*Phlox speciosa* Pursh, var. *congesta* Gray (var. nov.), June, 1886.

In his remarks on *Macrocalyx micranthus*, Mr. Coville has evidently overlooked the notice in "Plants from Baja California," Proc. Cal. Acad. ser. 2, ii, 186.

Conanthus aretioides is reduced to Nama as *Marilaunidium aretioides*. If in obedience to Kuntze, Nama is applied to a different genus, one would think that Conanthus being reduced, it and not Marilaunidium should be the accepted name for Nama.

Mohavea breviflora can hardly be specifically distinct. Specimens of *M. viscida* with leaves as broad and nearly as short were sent by the writer to Gray in 1884.—They were collected at Amboy Station on the Mojave Desert. Mr. Brandegee collected the form described by Mr. Coville, at Keeler, in April, 1891—some of the corollas were conspicuously dotted while in others growing beside them the purple dots were nearly or quite wanting.

Sarcobatus Baileyi Coville, is founded on dwarfed and perhaps diseased specimens, for the large fruiting bracts contain not even the rudiment of an ovary. Our specimens of *S. vermicularis* do not sustain the remarks of the author, for the female flowers are as Bentham & Hooker say, axillary and solitary on leafy shoots of all lengths from 5 mm. to 1 dm. long—of course the longer the fruiting branch is the more flowers will be found upon it. There is certainly no such thing in any of our specimens as a "floral axis" of the female flowers, the fruiting branches are normally terminated by the male spike but it is often wanting, and the bushes seem even to be occasionally diœcious. If this stunted pubescent form deserved specific rank it would have *Sarcobatus Maximiliani* Nees, figured in Bot. Zeitung, vol. ii, 753, t. vii.

The new genus Phyllogonum can hardly be considered sufficiently distant from Nuttall's Stenogonum, in which though the single species is now referred to Eriogonum, the involucre is a very variable quantity, Nuttall said it had none. The embryo of Phyllogonum is described as "nearly straight, radicle lying along one angle of the seed; cotyledons orbicular, lying at the

base of the seed, bent at an angle of about 45° from the radicle." The artist has not been very successful in depicting a triangular ovary and akene.

Bloomeria aurea Kell, has its name changed to *B. crocea* on account of the *Allium croceum* Torr. Boh. Mex. Bound 218 (1859). But *Bloomeria aurea* was published in "The Hesperian" with a colored plate, December, 1859, and the month of the Boundary publication ought to be convincingly set forth before a name already well established in floriculture is disturbed.

Ephedra viridis named from imperfect material, occurs scattered through the range of *E. Nevadensis*, of which it is probably only a form. It is very bad practice, especially on the western side of the continent, to give currency to species no better characterized than this and *Potentilla eremica*. K. B.

The Genus Phyllospadix, by WILLIAM RUSSEL DUDLEY. Reprinted from the Wilder Quarter-Century Book. An interesting account of the genesis and structure of Phyllospadix. The author is evidently of opinion that the differences between the two forms are so slight as hardly to warrant their continued separation. The author has had better facilities than any previous student of the genus and the two excellent plates give one for the first time an adequate idea of the structural details of the plant.

Manual of the Bay Region Botany, A Systematic Arrangement of the Higher Plants Growing Spontaneously in the Counties of Marin, Sonoma, Napa, Solano, Contra Costa, Alameda, Santa Clara, San Mateo, and San Francisco. By EDWARD LEE GREENE. The title should have been *A Phanerogamic Flora of—— counties in the State of California, omitting Typhaceæ, Lemnaceæ, Naiadaceæ, Alismaceæ, Juncaceæ Cyperaceæ Gramineæ, Coniferæ and numerous species in the other orders; with thirty "new species" none of which are new, and nearly all vaguely characterized both as to character and station; and with every change of name which the author's present knowledge admits.* The work is a second and much restricted edition of the unfinished "Flora Franciscana," which under its misleading name included the

plants from Mt. Shasta to Tehachapi and the whole breadth of the State. The useful part of "Flora Franciscana"—the dates, citations and synonymy have been carefully omitted. The orders as presented by Mr. Greene furnish us some unfamiliar names such as Amarantoideæ, Tithymaloideæ, Sarmentosæ. From Rosaceæ he separates Pomaceæ and Drupaceæ; Cichoriaceæ from Compositæ considering it much nearer Lobeliaceæ; and Cuscuteæ from Convolvulaceæ. In the matter of genera he has cut himself loose from all trammels crediting Dioscorides with 38 genera, Theophrastus with 14, Pliny with 32, Vergil, Varro, Dillenius and Micheli, each with 4, Brunfels with 12, Vaillant with 7, Dodoens with 8, Columna with 6, Lobel with 5, Galen, Tragus, Nicander, Gesner and Dalechamps each with 3, and 1 or 2 each to Catullus, Valerius Cordus, Cortusi, Ruppius, Chabræus, Mutis, Ruellius, Clusius, Camerarius, Matthiolus, Cæsalpinus, Tabernaemontanus, etc., etc. The kaleidoscopic changes of generic names must keep his unfortunate pupils on the rack. *Clematis* again takes the place from which he ousted it in Fl. Fr. for *Clematitis*. The yellow-flowered watercress is to be called *Rorippa;* while the white-flowered species are retained under the old name. *Franca* takes the place of *Frankenia; Vibo* is substituted for *Emex; Hippocastanum* for *Æsculus; Siliquastrum* for *Cercis; Oxys* for *Oxalis; Butneria* for *Calycanthus; Pseudacacia* for *Robinia; Medica* for *Medicago; Opulaster* for *Neillia; Therofon* for *Boykinia; Limnopeuce* for *Hippuris; Sphondylium* for *Heracleum; Distegia* for *Lonicera involucrata; Ecliptica* for *Eclipta; Gnaphalodes* for *Micropus; Heleniastrum* for *Helenium; Centrophyllum for Carthamus; Triodanis* for *Specularia; Brossæa* for *Gaultheria; Meadia* for *Dodecatheon; Alsinanthemum* for *Trientalis; Pervinca* for *Vinca; Plantaginella* for *Limosella; Bellardia* for *Bartsia; Gale* for *Myrica; Limodorum* for *Epipactis; Orchiastrum* for *Spiranthes; Bermudiana* for *Sisyrinchium; Vagnera* for *Smilacina; Unifolium* for *Maianthemum; Disporum* for *Prosartes;* etc., etc.

Prof. Greene apparently in the full belief that only his book will be used hereafter, sedulously refrains from mentioning the well-known equivalents of his adopted genera and we give them for the benefit of any student who may chance to lack a large

library, and be puzzled by the names of that obscure treatise commonly called "The Botany of California."

The species are of course split to the utmost, the most trivial attribute furnishing sufficient cause for resurrecting an old synonym or making a new species. The descriptions, when not compiled, with the more important characters omitted, are descriptions of specimens instead of species; in a very large number of cases so defined—or undefined—that no distinction is shown—the organs mentioned in one diagnosis being omitted from others; often absurd misstatements are made, for example, the "rich brownish red" *Nuphar polysepalum;* the "capsular, circumscissile" fruit of Garrya; or *Campanula exigua*, found "only the very summits of the highest mountains, Diablo, Tamalpais, and Hamilton" when in fact it is most abundant at moderate or low elevations, such as the upper end of Mill Valley, perhaps 500 feet; Bolinas Ridge, 1600; and St. Helena just above the toll house — which is only 2300 feet above sea level.

The principle upon which genera are united or divided is past finding out. Bigelovia for instance of which only two species occur in his limits, has them divided between Ericameria and Isocoma; Lonicera separates into Caprifolium and Distegia; Hemizonia into Calycadenia, Blepharizonia and "Centromadia" a new genus for the *pungens* group; etc.; while he coolly unites Spirostachys a genus with flowers borne in the axils of persistent scales, and albuminous seeds with a dorsal nearly straight embryo, into Salicornia a genus bearing its flowers in excavations of the joints, seeds without albumen and with conduplicate embryo; and Eremocarpus with imbricate sepals and 1-locular ovary into Croton which has usually valvate sepals and 3-locular ovary, passing over Crotonopsis with nearly the characters of Eremocarpus.

Attention has been called in a previous paper* to Prof. Greene's scanty knowledge of the flora of even his immediate vicinity. In the preface to his book he asks those who may make use of it to furnish a record of additions within its limits. We subjoin a few, which readily occur to us:—*Brasenia peltata*, Bouldin Island; *Wislizenia refracta*, Lathrop to Stockton; *Polygonum Parryi*,

* Zoe IV. 68.

Howell Mountain; *Eriogonum fasciculatum*, San Francisco; *Chorizanthe polygonoides*, Tamalpais and Oakland Hills; *Chorizanthe uniaristata* near Livermore; *Lastarriæa Chilensis*, common between Antioch and Mt. Diablo; *Claytonia diffusa*, Mill Valley, Tamalpais; *Elatine Californica*, Suisun and Antioch; *Caulanthus crassicaulis*, near Altamont; *Fremontia Californica* near Wright's in the Santa Cruz Mountains; *Ceanothus rigidus*, Tamalpais; *Rubus leucodermis*, Sonoma County; *Glinus Cambesidesii*, San Joaquin Bridge; *Cypselea humifusa*, same locality; *Callitriche sepulta*, San Francisco; *Œnothera Californica*, near Antioch; *Œnothera gauraeflora*, near Livermore; *Circæa Pacifica*, specimens in Herb. Cal. Acad. marked "Tamalpais" Kellogg; *Crantzia lineata*, Antioch and Martinez; *Ledum glandulosum*, Point Reyes; *Pleuricospora fimbriolata*, near Healdsburg; *Hydrophyllum occidentale*, slopes of Mt. Diablo above Clayton; *Mimulus Congdoni*, near Lagunitas in Marin County; *Mimulus Rattani*, summit of Tamalpais; *Linaria vulgaris* near Valley Ford in Marin County; *Utricularia vulgaris*, near Olema, Bouldin Island, and about the railway trestles of the San Joaquin; *Boschniakia strobilacea*, Tamalpais and Mt. St. Helena; *Lycopus sinuatus*, *Scutellaria galericulata* and *S. lateriflora*, Bouldin Island; *Anemopsis Californica*, Alameda marshes, Collinsville, etc.; *Odontostomum Hartwegi*, near Napa.

There is let us hope no botanist prepared to follow Prof. Greene in his wild hunt through the lexicons, for names, many of which if they could possibly be identified with certainty, would still be only manuscript names. Any date earlier than that of Linnæus involves a prodigious waste of time and long uncertainty, and with the evidence of his writings before us we submit that Prof. Greene's time could be much more usefully spent in taking an elementary course in botany at Harvard or Stanford.

A year or two before his death Dr. Gray dubbed the author "The new Rafinesque." In this he was unjust to Rafinesque who was at once a great egotist, a little mad, and somewhat of a genius. Prof. Greene lacks the genius. K. B.

NOTES AND NEWS.

Prof. C. Sargent of Harvard, accompanied by Mr. W. M. Canby, are on this Coast, looking at trees for the benefit of the "Silva of North America." They have visited San Diego, San Francisco, Berkeley, Palo Alto, Monterey, etc., and go from here to Santa Barbara, San Bernardino, etc., returning to the East by way of Arizona, where they will make investigations.

JACKSONIA, R. Br. "I am sorry to find that I was in error in supposing (p. 348) that no new name had been substituted for *Jacksonia* R. Br. Prof. E. L. Greene has replaced it by *Piptomeris*, a name under which Turczaninow described a single species referred by Bentham to *Jacksonia:* and proceeds to enumerate thirty-five species under this title. With the aid of the printer he contrives to invent two fresh names: P. 'dilalata' for J. dilatata Benth.; and P. 'purpuascens' for J. purpurascens Muell. It is to be regretted that some more useful or at least less mischievous outlet cannot be found for the superabundant energy of which Prof. Greene seems to be possessed."—JAMES BRITTEN in *Jour. Bot.* xxxi, 274, (December, 1893).

Mr. and Mrs. T. S. Brandegee have taken up permanent residence in San Diego, Calif.: partly for the more agreeable climate and partly to be nearer the chosen field of Mr. Brandegee's botanical labors. They take with them their excellent botanical library, and private herbarium.

Prof. Douglas H. Campbell goes to Europe at the end of the term to spend six months in botanical researches.

With this number completing the fourth volume, the publication of Zoe will cease for the present. For a journal of its age and character it has received good support, and closes with a steadily increasing subscription. It has been, however, too serious a drain upon the time of the editor, and interferes materially with work of more present importance.

INDEX.

Simple lists or mention, not indexed.

EASTWOODIA ELEGANS

FAXONIA PUSILLA